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SMOKE RINGS

BACK TO THE FUTURE

As Editor, I am regularly contacted
by readers seeking informa-
tion on past articles and in this
month's postbag, Ian Fisher lists
several past tooling designs that he has
made. Reflecting this interest, this issue
reproduces an article by Edgar T. West-
bury about a simple indexing fixture. In
a break with previous 'reprints' we have
had the figures redrawn to make them
easier to interpret, and also produced
some 3D renders, as the original photos
are not very clear. Although undimen-
sioned, the construction is such that a
typical reader should have no problem
with making the device; one that could
prove invaluable to anyone with limited
workshop equipment. The sprung-arm
indexing system could easily be trans-
lated to a more robust design, using a
chuck or collet. Another option would
be to use 3D printed 'gears' for indexing – this would allow any arbitrary number
of divisions to be obtained with great simplicity. For a contrast with ETW's design,
the photo shows the tailstock indexer I made for my mini-lathe – this originally
appeared in ME 4230 in September 2004 and I'm still using it!



While my priority for the magazine remains presenting fresh and original
content, I am interested to hear from readers with any suggestions for other past
designs, tooling or models, that are worthy of revisiting in this way.

TG JONES CLOSURES

Some readers are concerned that planned closures of many former WH Smith
stores taken over by TG Jones will leave them without a traditional newsagent on
their high street. This could have a big impact on many magazines, not just ME&W.
Please see this month's On The Wire on page 58 for details of other ways to ensure
you get regular issues of ME&W in the future.



Neil Wyatt
Editor

Neil

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Extra Content!

There's lots of extra content to be found online to support past articles in Model Engineer & Workshop.

Visit the www.model-engineer.co.uk forum

You can find Roger Backhouse's useful article on disposing of a workshop using this QRcode.



Hot topics on the forum include:

How do I learn machining ? – started by Paul1956.
A useful collection of advice for new entrants into the hobby of model engineering.

Links For Workshop and Model Engineering STLs and Other Files – started by Neil Wyatt.

At the request of forum members, here's a place to share links to useful 3D print designs.

Myford VMC Spindle Advice Please - Started by Nigel Graham 2.
Forum members share advice on maintain these highly regarded machines.

Come and have a Chat! As well as plenty of engineering and hobby related discussion, we are happy for forum members to use it to share advice and support. Come and join us – it's free to all readers!

On the Cover



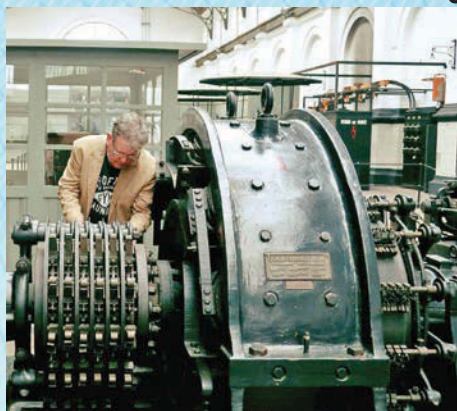
Our cover features photo John Chadwick's Cellars Clough pumping engine photographed at the Bolton Steam Museum by Roger Backhouse. Read about his visit on page 17.

Next Issue



In our next issue, the editor visits Tankfest 2026.

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An Air Powered Hand Engraver

Mitch Barnes describes the making of a low-cost air engraver, his article was developed from a talk given to SMEE's Engine Builder's Group during the lockdown of 2020.



To most model engineers the idea of an engraving machine conjures up images of pantograph engravers that are used to create signs and labels, as well as, for the model engineer or modelmaker, a method of producing components such as loco frames, connecting rods and other flat bits for small scale models. Although they have largely been replaced in the modern digital world with laser cutters and laser engravers, there is still a whole world of possibilities with these machines which is why I have one in my workshop, ready to be commissioned.

But the device I will be describing in this series is a different animal entirely – it's for hand engraving.

Most readers of this magazine will be familiar with hand engraving on items such as trophies, clock faces, ciggy lighters and such like going back several hundred years, an artform that requires incredible skill and concentration. From the beginning this has been carried out using small chisel-like tools called gravers, which are made of tool steel and come in a variety of cross sections and shapes, **photo 1**. Differently shaped gravers give different cut shapes, allowing different line thicknesses and shapes to be produced, almost an equivalent of different brush shapes helping impart expression when painting a picture. This is especially relevant when producing copperplate engravings for illustrative purposes such as printers' plates, where they preceded the use of photography in books and other publications, being a more refined but expensive option for the printer than woodcuts.

PART 1



Photo 1: A typical palm-pushed engraver's push Graver.



Photo 2: This face on a longcase clock was made by Richard Deaves (1702-1780) of Whitchurch in Shropshire – entirely handmade and a nice example of the country clockmaker's art.

Engraving on steel or copper plate was also used to create illustrations for wall art such as prints and engravings that as antiques, are still widely collected today. An engraver would need a selection of gravers to carry out his daily work. The different shapes allow a wide variety of cut densities to be engraved, so creating the impression of varying tones within a monochrome engraved artwork. With illustration, the different line thicknesses and their density on the surface of the copper plate is used to vary the tones of light and shade of the inked image of the print.

Figure 1 is an example of a copperplate engraving. You can see that engraving lines to create the image gives an illustrator the ability to create different textures including shading by varying line thicknesses and their density.

These effects can also be executed as decoration, of course, on items that one wishes to engrave such as clock faces, cigarette lighters, badges, shotgun receivers etc., as the clock face in **photo 2** reveals. Being at least the best part of 250 years old, the silvering on the face has largely gone but it is still an impressive piece of the engraver's art.

IT'S LOVELY BUT HOW WAS IT DONE?

Hand engraving for illustration involves pushing a carefully sharpened graver around a sheet of hard metal to create the design required, whether artistic renderings or scale drawings. I understand that on soft metals push engraving using the engravers wrist is most commonly used but on hard metals a hammer is also often used to push the graver along.

When engraving objects such as the centre of the dial in the clock face above, the different geometries of cut produced by gravers of different shapes alters the way the light catches the cut. This facet of the art is something that cannot be reproduced by machine or laser cutting, which in turn adds to the uniqueness, artistry and ultimately, the desirability of the technique to collectors.

Push gravers usually have mushroom-shaped handles, **photo 3**, which are pushed by the palm of the hand to minimise discomfort while maximising the force one can exert, but a mechanised version of push engraving reduces that strain and discomfort even more.

But before we start, isn't this a dead craft? Fortunately not entirely. Machine and now laser engraving has largely

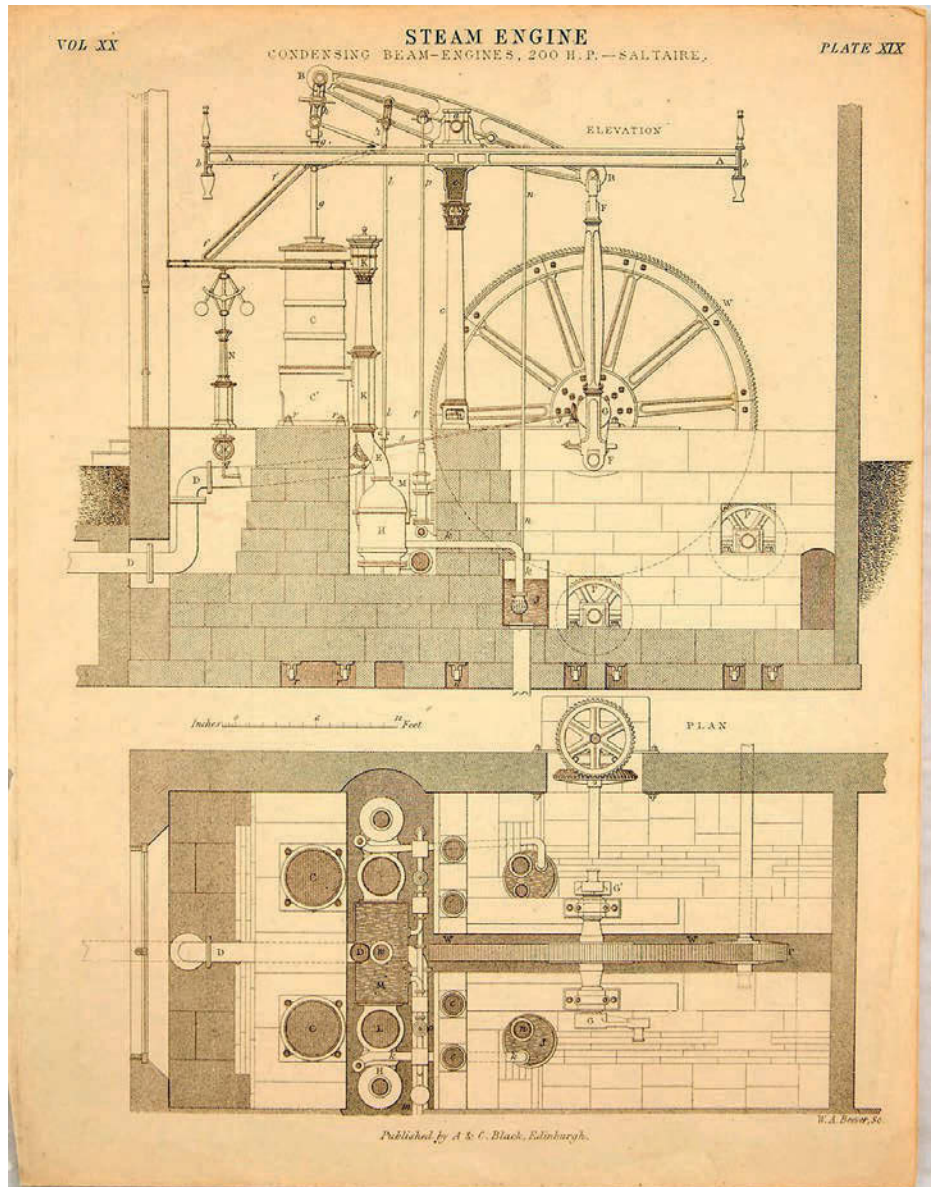


Figure 1: This is a contemporary copperplate engraving of the 200 Horsepower Double Beam Engine installed at Titus Salt's Mill at Saltaire near Bradford in around 1853.

taken over on such items as trophies, while copperplate illustration passed away long ago with the introduction of photo reprographics - but "push engraving" has experienced a revival.

There are two basic types of air powered engraver handpiece: those with a simple piston and spring arrangement at the lower price range and others that involve a complex system of internal valves which are very much at the higher end.

These handpieces are designed to minimise stress on the palm of the hand by doing the pushing themselves, allowing work to be carried out far more quickly and allowing the artist to concentrate on guiding the graver's cutting edge to where it's wanted, without compromising the shapes of cut that are so important to this art form. Air powered engraving enables

the engraver artist to create more free-flowing lines in their work far more easily than push or hammer gravers usually permit, eliminating some of the physical constraints of those hand or hammer-pushed gravers, but still involving a high level of skill.

The techniques for air powered engraving are subtly different to produce the same result - though with less strain on the wrist. The results though from the use of pneumatic engraving can be outstandingly beautiful as an art form. Instead of having a selection of push gravers of various shapes, the engraver artist will have one or possibly two air powered handpieces which would be used with a selection of interchangeable collet-mounted gravers of different shapes to produce the wide variety of cut



Photo 3: An array of traditional push engraving Gravers. This selection would cover the majority of the shapes and widths of line that an engraver would require to produce his work.

shapes required for a particular piece. These different gravers tend to be fitted in a standard design of collet so that they can be rapidly changed in the handpiece to ease interchangeability.

Engraving has experienced a resurgence on both sides of the Atlantic in recent decades and there are full-time engravers earning a good living with the artform. A quick Google search will reveal a lively industry with many commercial practitioners creating some stunning work. Hand cut engraving has a different look than photo-etching or machine engraving due to the shapes of the cuts involved and to the best of my knowledge, no automated means of creating those cut shapes has so far been devised. The collectability of engraved objects lies in the recognition that all these artefacts are decorated with the skill of the human engraver and are, above all, unique. This uniqueness still counts with air powered engravers as they still require the same high level of skill to master as push engraving. The basic advantage to air powered engraving is essentially speed and ease of movement.

These days many professional engravers are largely occupied with decorating collectable guns, itself a tradition that goes back to mediaeval weapons and suits of armour. If you have pesky pigeons in your garden, a few hundred grand burning a hole in your pocket and are prepared to wait, you could do worse than invest in a Purdey, Nelson, Fox or Holland and Holland shotgun to shower those sky rats with buckshot, comfortable in the knowledge that these weapons can come with whatever decoration you fancy, exquisitely engraved on their receiver, **photo 4**.



Photo 4: The work of a master engraver, this shotgun receiver is representative of the quality of work produced by top engravers. No CNC here!

WHAT IS AN AIR POWERED HAND ENGRAVER AND HOW DOES IT WORK?

In 1975 an American engraver called John Rohner invented the AirEngraver and within twenty-five years, engraving using powered handpieces started taking over in the world of professional hand engraving, **photo 5**.

Basically, it works, albeit with different internals, a bit like a pneumatic drill in that the piston inside the push engraver handpiece is moved in and out by compressed air. The system consists of a compressor with a method of producing or regulating the output of air, an air line connecting this to the handpiece into which a graver bit is fitted. There is sometimes a foot pedal which varies the amount of air reaching the handpiece, by physically squeezing



Photo 5: This is a typical air powered engraving handpiece, with its bulbous palm handle, fluted locknut securing the shaft with radial air holes, and a collet at the front, ready to accept a graver.

the airline to constrict it and this gives another variable for control. One or two people can engrave at the same time with commercial setups, shown in **photo 6** by two hand engraver tools showing two different commonly used collet arrangements, though equally it means that a single engraver has two different graver bits quickly to hand.

To enable an experienced hand engraver to transition easily to an air powered engraver, the handpiece needs to be virtually the same size and weight as a conventional push graver, so that the engraver doesn't have to learn a whole new set of techniques. Therefore it should be small enough to fit within the confines of your hand with your fingers outstretched either side of the shank of the handpiece just as a push engraver does. The adjustable internal mechanism moves at a rate up to 15,000 strokes per minute and they can replace hammer or push engravers with far less fatigue than the traditional tools.



Photo 6: A lower priced but professional commercially made system with two handpieces driven from its own self-contained compressed air system.



Photo 7: Quality doesn't have to shout to get noticed.

If money is no object, one could easily(!) purchase one of these systems off the shelf at a considerable cost. Lindsay AirGraver units made in the USA use a different system called Pulse Electromagnetics and cost upwards of \$2,000 for a basic handle plus compressor system to drive it: you can easily change the dollar sign for a pound sign by the time it shows up on your doorstep in sunny Blighty but that kind of sum was out of the question, for me at least. Looking at them though, you can see why, **photo 7**.

I understand that the handpiece senses the pressure that the user is applying to the push handle and adjusts the rate of cut accordingly, making the AirGraver almost truly an extension of the operator's hand.

Somewhere close to that upper end of the price scale lies a system by GRS, again beautifully made as is all their product range.

Lots of less well-heeled folk around the world have built their own more basic but still-capable setups, using everything from stainless steel bolts and plumbing tube to interchangeable-head screwdrivers as the handpiece. There are videos on YouTube on the subject, and they can often give the viewer a good understanding of how these tools work. The example shown below really was made of plumber's pipe, in Asia, **photo 8**. Just because it's cheap, it doesn't mean that this handpiece is hopeless. It doesn't have a consciousness and therefore doesn't know that every expense was spared in making it, so yes, it works. I never cease to be inspired and amazed at the ingenuity of people who make incredible things with limited resources in the harshest of conditions.

There is a British whippersnapper called Shaun Hughes, who while

sounding like a scallywag, shows you how to build a system on YouTube. Either bereft of funds or simply wanting to defeat a challenge working with appalling hand tools, he built his handpiece from a cheap screwdriver and makes his own gravers from masonry nails! Being an innovative and clever chap he modified a cheap emergency type tyre compressor for his power source and mine is based on his modifications. He must be an artistic genius as well as a fantastic craftsman because his work is quite exquisite and so intricate that like many of the best engravers, he carries it out much of it under a microscope. I assume that he earns his living from this, as he's mentioned that he'd achieved his mythical 10,000 hours that Malcolm Gladwell famously said in his book *Outliers*, brings one to true expertise. If this is Mr Hughes' only income stream, I wish him the very best of luck – he truly deserves to do well.

WHAT ON EARTH POSSESSED ME TO BUILD AN AIR POWERED HAND ENGRAVER MACHINE?

As some readers will know, I spend a bit of my life restoring antique stationary steam engines and they occasionally have engraved plates denoting what they are or who made them, so the notion of engraving plates for these (where the builder is known) rather appeals to me when the maker of an unmarked model is known, so it can be for posterity.

Having given it a try, push engraving did put rather a lot of strain on my wrist as it does to many of the professional practitioners, especially those who like me, are getting on a bit. Without something mechanical to ease the



Photo 8: This device was made from plumbers pipes: yes it works fine.

strain I could see RSI dominating my future. The answer lies in air powered push engraving then.

Jake Sutton creates fantastic clocks and had also demonstrated these devices at shows I'd attended. While I was time limited and wasn't able to watch him working back then, it registered with me and sowed a seed.

I was reminded of these pneumatic hand engravers by fellow SMEE member Simon Taylor, who built one some time ago but later gave it away to an antique restorer friend of his, something he soon regretted! Luckily he took some photos! **Photograph 9**.

In the spring and early summer lockdown of 2020 Simon expressed a wish to build another setup so we teamed up at our respective homes via telephone and email and, lockdown notwithstanding, decided to build a set each. We looked at a lot of videos online and between us, the setup I describe here has been largely devised by him, but the example described in this series has been built by me.

As those who know me will testify, any piece of electrical equipment consisting of more than a single piece of wire seems totally beyond my level of comprehension, so Simon came up with the plan for that side of the project, which I copied for my system, and I have carried out the mechanical part of my system. It must be said though, that Simon is a fine engineer and easily built another of these systems for himself, just as he'd done before.

WHAT DOES OUR SYSTEM CONSIST OF AND HOW DOES IT WORK?

The system we have built is illustrated here, **photo 10**. The bits that need modifying are the compressor and the handpiece and I selected and modified a case for it all to fit into. I should state that I did all these jobs concurrently because much of the time I was awaiting parts to arrive but for clarity I shall describe them as if I'd

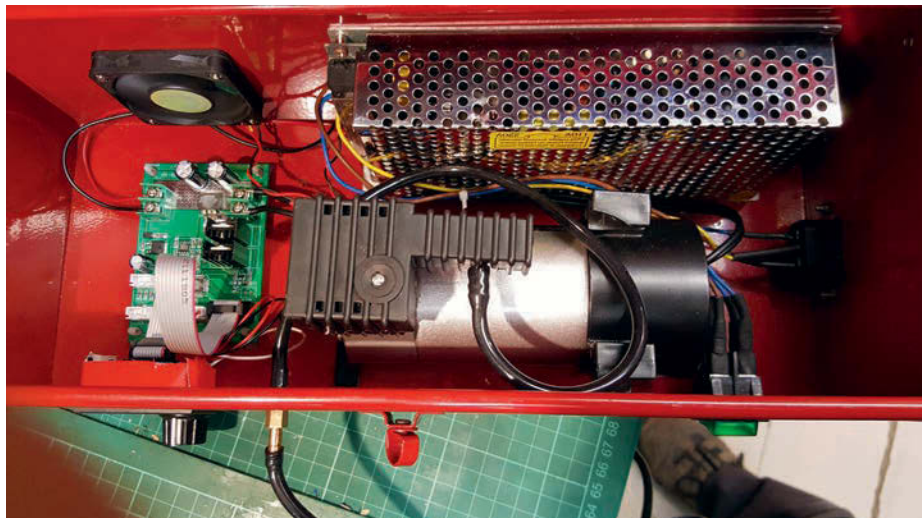


Photo 9: It doesn't matter what you use for a box but this simple and clever self-contained unit was given away too soon...

carried out each task in order.

Our version uses a mains power supply, with a 12 volt output of 25 amps, driving a modified small 12 volt tyre compressor from a power controller that can vary the compressor's speed, and is connected via an airline to a handpiece which holds the graver itself. This arrangement is based on two similar setups we'd looked at on YouTube.

Our system is a very economical and low-cost piece of equipment, the whole project costing each of us about £100, so a tiny fraction of the cost of a commercial equivalent. It would be perfectly possible to adapt it even more cheaply if you wish to build your own handpiece rather than work on a bought-in cheapo thing which we modified so that it would actually work...

I am no stranger to making my own tools and building this little system would be a challenge that would be worth it even if it was only going to be used for one job. We'd be modifying the compressor and the handpiece, so let's deal with each in turn. If all this sounds terribly tricky, bear in mind that I'm a bit of a chimp with making stuff and I surprised myself by making this work: if I can, so can you.

Of course, I needed the compressed air supply first, before we could find out whether the handpiece was any good, so the compressor would have to be adapted first.

COMPRESSOR MODIFICATIONS

The compressor's piston and cylinder are modified in that the one-way valves have to be closed off so that when the piston rises and falls within the cylinder, air is pushed out and then sucked back in again as each

stroke occurs.

To keep things the same, after much internet research, we settled upon and both bought the same items as far as the compressor and handpiece were concerned so that we could guide each other through our respective builds, as due to lockdown constraints, neither of us could visit the other's homes to compare notes.

Here's the tiny compressor as received, **photo 11**. What it lacks in sound it makes up for in noise. It was purchased online and there are many listings for many essentially similar clones available for the princely sum of between £12 and £25 (start searching with the criteria 'lowest price first' to save time wading through compressors that are probably far better than these but would have to be modified in ways of which I have no clue).

What Simon and I found, even though both of us bought from the same supplier and the same listing, they aren't necessarily the same! There are lots of



Photo 10: This is what I built, with Simon's help all self-contained in one box.

these listings online; there are many variations and no doubt more than one factory making them. However, I will proceed with the one I received, because the principles are the same whichever one you buy. Simon's compressor bought just a week later from the same supplier with the same listing, packaging and catalogue number as mine, was internally rather different! But the modifications were more or less the same on both of ours if varying in detail.

This is a 12v thing designed to attach to a car's cigarette lighter socket. I don't have a car, let alone a socket, and even if I did, I wouldn't want it parked in my workshop, so some mods need to be carried out to remove the need for a car. To make the setup truly portable a substitute 12v supply somewhat smaller and lighter than a car is required and other changes to the compressor would make it suitable to drive the tool if not a car, so on the next instalment – it's Surgery Time!

To be continued



Photo 11: Compressor as bought with accessories.



Photo 1: The display by Newton Abbot MES.

The South West Miniature Engineering Show

John Arrowsmith reports from the first major new model engineering show for many years.

This new venture in the South West was at Newton Abbot Racecourse and was similar in layout to those at Doncaster in years gone by. Held in the racecourse main building two large areas were arranged to provide good spaces for model displays, traders and visitors. Outside a large tarmac and concrete concourse enabled live steam models to operate. A good length of 7¼" gauge track was providing an adequate test for the two locomotives in steam. Alongside this the traction engine drivers were able to show off their engines' abilities to full capacity. The south Devon weather chipped in as well with long periods of warm sunshine to help the visitors to enjoy a real steam atmosphere.

Inside, the display of models and equipment was impressive with a

selection of large marine models and steam powered models – both locomotives and stationary engines – and some excellent machine tools and equipment to satisfy any discerning modeller. Alongside these displays were fine exhibits by the attending traders from boilers to fittings and materials, in fact most things any model engineers uses regularly.

Starting with the clubs and societies there were twenty-two of these listed, which was a very good start for the first exhibition at this site. The most local society was the **Newton Abbot MES** who provided a comprehensive display of members work, **photo 1**. There were excellent examples of many different aspects of model engineering, but one small detail would have helped here, short descriptions of the models to help

new visitors to understand what they were looking at. Being in southern England there were many examples of Bulleid design locomotives with **Bulleid Builders Group** prominent with a variety of locomotives on show, **photo 2**. The **Exmouth Junction** display showed some first-class models of the different classes both in original condition and the rebuilt types, **photo 3**. In addition to these presentations, the **General Steam Navigation Locomotive Restoration Society** is involved in restoring a full size Merchant Navy class locomotive No. 35011 *General Steam Navigation* to original condition, as it was in 1959. before the usual rebuild was carried out by BR. They had a good chassis displaying the basic characteristics of these fine locomotives, built by Andy Cadell.



Photo 2: The Bulleid Builders Group display



Photo 3: The front of Exmouth shed with different classes of Southern engines on show.



Photo 4: A 7 1/4" gauge version of "Lion" on the Bristol SMEE display.



Photo 5: High Speed Tethered cars on the Bristol SMEE display.



Photo 6: The National 2 1/2" Gauge Association stand.



Photo 7: Kelly's Mine Preservation Society had a presentation of their work.

The **Bristol SMEE** is a well-known model engineering society in this part of the world and they had a display showing what they have to offer any model engineer in the area. An excellent example of a 7 1/4" gauge Lion caught the eye, **photo 4**, and something that is not seen very often these days are tethered racing cars. The Bristol club had a selection of sophisticated looking cars on display, **photo 5** provided by David Giles, including a world speed record holder. They also introduced their Young Engineers Project with eight young

people all building the same model of 'Ellie' the tram engine. They also have three older members working on this project who wanted to learn the basic skills needed to become a model engineer. A lesson to be learned here, perhaps? An interesting display by the **National 2 1/2" Gauge Association** showed some of the range of prototypes available in this popular gauge, **photo 6**. An unusual presentation was by the **Kelly Mine Preservation Society** who had a compact display of the history of mining grey micaceous haematite, which is a form of iron

oxide, Fe₂O₃, **photo 7**, accompanied by a working model of a California stamping machine powered by a small stationary engine. Another group, which in all my years of reporting I had never come across before, was the **Broad Gauge Society** who specialise in Brunel's legacy with an excellent selection of models and information. The larger model on display is based on the Bristol and Exeter Railway 4-2-4 of 1853 designed by Pearson, **photo 8**. speed tether In approx. 1 1/32"-1ft scale it was quite a large model. The selection of Broad Gauge

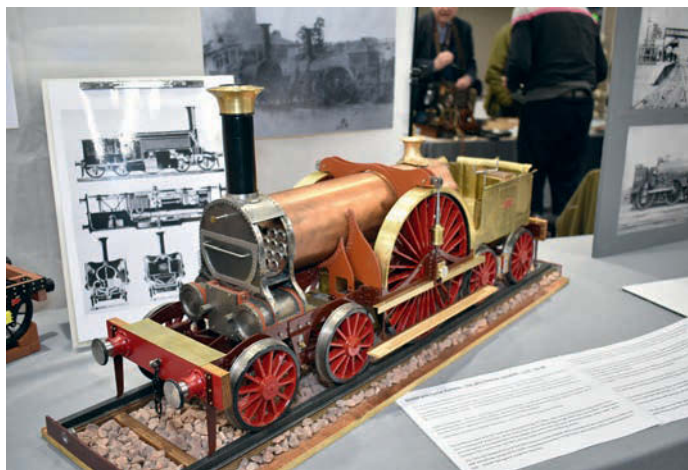


Photo 8: An example of a Bristol & Exeter Railway 4-2-4 locomotive circa 1853 designed by James Pearson.



Photo 9: A 3 D printed model to prove a design.



Photo 10: Part of Dan Payne's amazing collection showing some of his marine models and details.



Photo 11: Part of the Colorado Springs G scale layout..

prototypes are all scratch built in 7mm or 4mm scale. Another interesting model here was a prototype model of a GWR Sun Class locomotive *Antelope*. This model has been created using 3 D printing to prove the design before cutting metal, **photo 9**. To me it looks an excellent example of using modern technology to prove a very old design.

There was an amazing display of large-scale ships and military vehicles from a member of the **Wherrytown Model Boat club** in Cornwall. All beautifully made and full of interesting details and equipment. HMS Ark Royal the aircraft carrier had so much detail on board it is impossible to describe everything, the time the builder Dan Payne had spent on this and I am surprised he had time for all his other models. A superb display, **photo 10**. Directly opposite was another model railway layout by a member of the **G Scale Society**. This large layout *Colorado Springs* depicted a wild west town. Again so much detail it is hard to describe but he told me that some of his buildings are now quite rare and as individual items have become available there is a complete mix of types on the railway. All very colourful and a great attraction for the younger

visitors, or anyone who has the space for a layout of this type, **photo 11**. The **Westland & Yeovil MES** collected a varied and colourful display with some good locomotives with a 5" Gauge SR L1 4-4-0-taking centre stage. An unusual prototype in 32mm gauge was a 0-4-0 + 0-4-0 Pechot-Bourdon

Narrow Gauge double boilered articulated steam engine, built by Baldwins for the French in WW1, **photo 12**. Note the blackout curtains on the cab. A fine group of stationary engines and a Minnie Traction engine completed an interesting stand.

To be continued.



Photo 12: An unusual model of a Pechot-Bourdon 0-4-0-0-4-0 WW1 French Steam locomotive in 32mm scale.

Bolton Steam Museum

Roger Backhouse takes a detailed look at a collection of stationary steam engines that gives a remarkable insight into our industrial heritage.

PART 1



Photo 1: General view of Bolton steam museum, one of the best collections of steam engines anywhere and all in immaculate condition. Well worth a visit.

Thanks to the hard work of Northern Mill Engine Society members, the former mill town of Bolton, Lancashire, has one of the finest collections of stationary steam engines in Europe, **photo 1**. Although engines are not like the giant pumping engines at Kew Bridge, Ryhope or Papplewick the variety is remarkable, and engines are presented in immaculate condition. Museum curators sometimes like to show objects as found, or as they would have been working. Mill engineers took real pride in clean and polished engines, so the glossy appearance is entirely true to prototype.

The collection also covers auxiliary equipment, adding to the interest of a visit which will be reported in four parts, the first covering some older engines, with more following about other engines and engineering tools

and equipment displayed. The museum displays the evolution of the steam engine and features of engine working using models as appropriate. For example, a working Newcomen engine model illustrates one of the earliest successful engines, **photo 2**. There are helpful displays and informative captions, something large national museums could learn from.

Graham Gardner gave an introduction to the museum in *Model Engineer* 4590, 6 July 2018, and this article adds more detail.

HISTORY

Lancashire once produced more than half the world's supply of cotton goods. Cotton production also spread to Scotland, Yorkshire and other parts with cotton mills found even in London's East End. Sadly, the industry



Photo 2: Newcomen engine model. The first practical engine design to use steam - which was condensed to make a vacuum powering the piston. It was extensively used in mine pumping but could not be used for rotary motion and hence was not useful for textile mills.

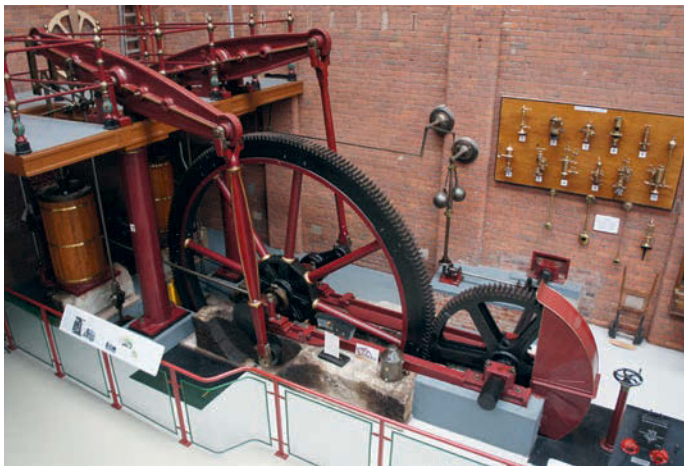


Photo 3: Crossfield Mill beam engine powered looms weaving flannel. It worked from about 1838 to 1953 and was rebuilt in 1893 to make it a compound.



Photo 4: Crossfield engine cylinders lagged with wood. The high-pressure cylinder is on the right.



Photo 5: Basic Watt type governor on the Crossfield engine

over expanded and growing overseas competition led to the industry's decline after the First World War. Many mills closed in the 1930s.

Some mills survived into the 1950s when another decline occurred. Mill engines that powered cotton spinning and weaving went for scrap.

Thankfully a group of enthusiasts formed the Northern Mill Engine Society in 1966 and began collecting for a museum started in 1968 at the Atlas Mills Bolton, once the world's largest spinning mill complex. The museum opened in 1983 where five rebuilt engines could be seen working under steam.

Although the mill complex was sold for redevelopment the new owners Morrisons Supermarkets were sympathetic and offered the museum a new home in the Atlas Mills former cotton store. This saved the collection, but engines had to be rebuilt to fit their new home. Luckily the building is spacious and has a gantry crane

overhead. NMES members, all volunteers, have done a first-class job of restoring, rebuilding and presenting the collection.

Members built a new boiler house so that engines are shown working on steam days throughout the year. On other days some engines can be seen working on electric power. Even as static machines, all are worth seeing.

Sadly, attempts to save some engines destined for preservation failed. The Dee Mill engine owned by Courtaulds in Oldham was built in 1907, one of the most up-to-date mill engines. Although scheduled as an ancient monument it was scrapped in 1994 after serious neglect though no fault of the NMES. Would a stately home have been allowed to decay like that? Probably not.

CROSSFIELD MILL ENGINE

The Crossfield mill engine, **photo 3**, may date from 1838 and is the oldest



Photo 6: Large flywheels were not cast in one piece but assembled from parts with the rim keyed and cottered together. Shown in one of several excellent displays in the museum.



Photo 7: The Cellars Clough beam engine once powered a woollen mill and was rebuilt to change from simple expansion to a compound.



Photo 8: Old advertisement for Cellars Clough mill at Marsden, near Huddersfield.

engine in the collection. Like many older engines the maker is not known, and it was rebuilt during its working life. The rebuilding happened in 1893 to make it into a compound engine with a new high-pressure cylinder. It then worked until as late as 1953 powering looms weaving flannels at Wardle near Rochdale and then lay derelict before rescue by NMES members.

Originally the large iron beams supporting the upper chambers were built into the stone walls of the engine house to give the whole engine stability when working.

The engine has a distinctive twin cylinder twin beam arrangement and originally both cylinders were the same size. Cranks are set at 90° to give a smoother drive and the piston rods are guided by Watt's parallel motion, an invention Watt considered his finest achievement. It allowed the curved motion of the pin at the beam end to be made a vertical motion of the piston rod. This enabled a beam engine to provide rotary motion, enabling use in many mill and factory applications.

Oddly, the connecting rods are quite different. One is a cast-iron rod of cruciform section and the other a round wrought iron rod. It was

never a powerful engine, most likely generating less than 30 hp at 40 rpm on a steam pressure of 10 psi. In 1893 a new boiler was installed providing steam at 60 psi and it was at this time the engine was rebuilt with a high-pressure cylinder. These cylinders are now 12" and 20" diameter with a 3'6" stroke, **photo 4**.

Originally there was a tank type condenser under the floor, and this survived to 1947 when it was replaced with a more modern type. The engine is governed by a basic Watt type governor linked to a throttle valve on the steam supply, **photo 5**. The museum has examples of different types of governors which will feature in a later article. (Readers wishing to know more about these fascinating items are advised to read John Hannavy's book *The Governor* (Pen and Sword. 2021).

A display shows how the 14-foot diameter flywheel was made. There were eight separate spokes and heavy rim sections keyed and cottered together, **photo 6**.

CELLARS CLOUGH BEAM ENGINE

This period beam engine dates from around 1870 but as with the Crossfield engine the maker is unknown. Unlike that engine this had one beam, probably not the best arrangement for a textile mill where smooth operation was required to avoid 'hunting' but nevertheless common in the early days of steam textile mills, **photo 7**.

This engine ran at Fisher Firths Cellars Clough Mill at Marsden, Yorkshire which made woollen and worsted goods. The mill was originally built by Samuel Dowse and then run by his son-in-law who neglected the business. It was later operated

by Fisher Firth & Co who ran it until the 1980s, **photo 8**. The mill was demolished quite recently.

Like the Crossfield, this engine was built into the engine house which caused problems when demolition for re-erection took place. The engine house had to be demolished in stages over several years to allow access to remove parts of the beam engine in turn.

The engine was originally single cylinder, but as increased power was needed along with greater economy it was updated in 1908. Using a system devised by William McNaught of Glasgow, it was made into a compound with a high-pressure cylinder added at the crankshaft end of the engine, **photo 9**.

Work was carried out by Woodhouse and Mitchell of Brighthouse in 1909. Incredibly, the original quote survives. The original cylinder became the low-pressure cylinder and a new beam was fitted. According to the NMES website this meant that the force from the new high-pressure cylinder acted in phase with the connecting rod and did not put the beam under more bending load.

The high-pressure cylinder was fitted with Corliss valves with slide valves on the low pressure. The flywheel of 18' diameter was built in eight sections. It weighs 30 tons. In rebuilding a rope pulley was added and this later drove an alternator when the mill was electrified, **photo 10**.

Power for the mill machines was transmitted from the smaller gear alongside the flywheel. Early in the engine's history this led to problems with vibration and noise. Eventually a completely new crankshaft, steel gear and outer bearing were fitted. The engine was complemented by a small horizontal engine alongside which will feature in a future article.

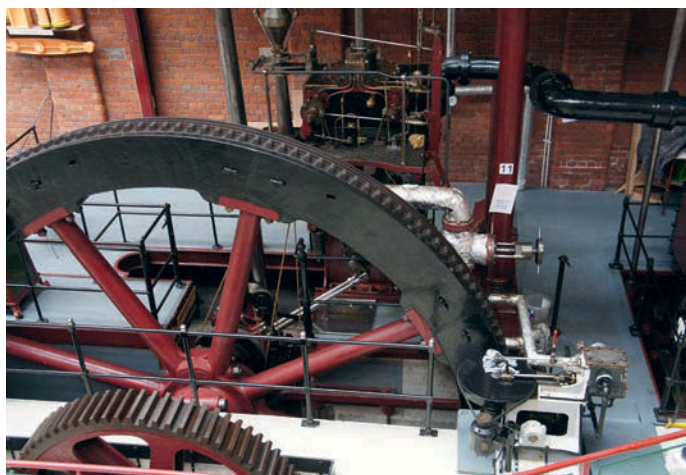


Photo 9: The flywheel for the Cellars Clough mill engine was built in eight sections fastened together.

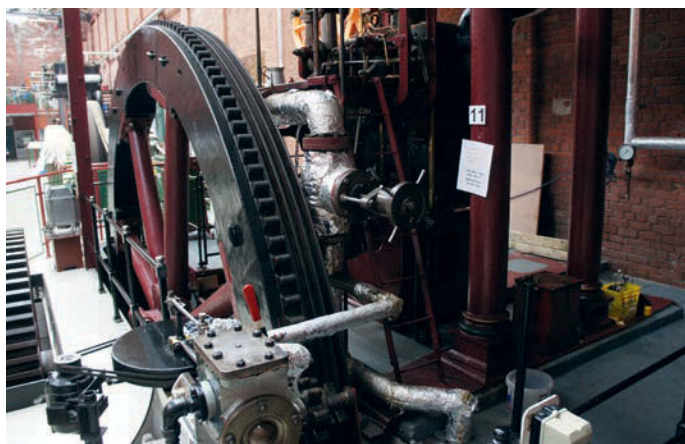


Photo 10: A rope pulley was later added to the flywheel to power an alternator supplying electricity to the mill.



Photo 11: Pumping engine supplied to Cellars Clough Mill by John Chadwick's Prince's Bridge Iron Works, Salford.

CELLARS CLOUGH PUMPING ENGINE

Mills often had supplementary engines used for tasks like pumping water, a purpose fulfilled by this engine, **photo 11**, made by John Chadwick of Prince's Bridge Iron Works, Salford. It isn't known when this engine was built but possibly around the same time as the main mill engine. Although a similar engine is illustrated in an advertisement of 1891, sometimes engines remained in production for many years so the exact date of manufacture cannot be certain, **photo 12**.

This single cylinder engine has a cylinder with a 6" bore and 11" stroke. Unusually it has a John Chadwick patented supplementary piston type valve integral with the slide valve chest. That is operated by the governor.

Unfortunately, this engine had been badly damaged when acquired but NMES members have done a superb job of the substantial restoration works required.

BARRACLOUGH VERTICAL ENGINE

This engine was built around 1860 and used in a glassworks near Barnsley, **photo 13**. It has a vertical cylinder at the base, driving a crankshaft and the flywheel. The flywheel is a replacement, the original having been badly damaged during removal.

Such engines were used in Yorkshire woollen mills but this type

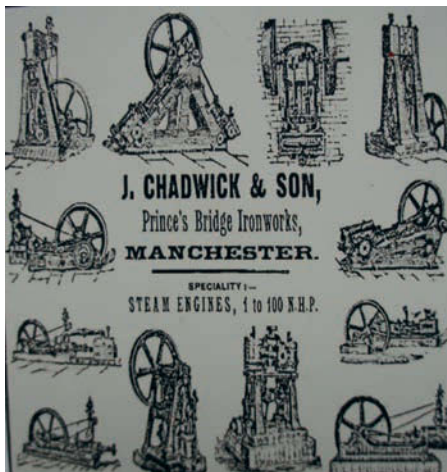


Photo 12: An advertisement for John Chadwick's engines from the 1890s intended to show the range of models that could be produced to order.

has the drawback of requiring a very substantial framework to hold the flywheel and crankshaft. Other engines generally used Watt's parallel motion, but this example has a crosshead running in machined slides.

With a 12" diameter cylinder and 2' stroke at one time the engine was fitted with a supplementary Meyer valve operating on the back of the slide valve, an unusual arrangement intended to improve economy. Unfortunately, such engines were often overloaded and engine efficiency was less important than the need for more power. This mechanism has now gone.

Typically for this period a simple Watt governor is fitted linked to a butterfly valve in the steam supply.

ABOUT THE MUSEUM

Bolton Steam Museum is behind Morrisons Supermarket in Mornington Road, off Chorley Old Road, Bolton, BL1 4EU. There is ample parking in the supermarket car park.

Admission is free but donations are welcome. (Please use Gift Aid if you pay income tax at the standard or higher rate, as that adds 25% to the value of your donation at no extra cost to you.)

The museum is open for static viewing (some engines may run on electric power) on Wednesdays and Sundays 11-3pm. It is best to check the website first before coming any distance on these days, which will also let you know the dates of the live steam days held through the year.

There is a tea bar serving drinks and biscuits but for meals and snacks try the supermarket. There is a lift and disabled toilets at the museum so it is very accessible. If you have mobility



Photo 13: Barraclough engine built around 1860 and used at the Redfearn Glassworks near Barnsley. The flywheel is a replacement.



Photo 14: Detail of the Kenyon vertical cross compound engine - to feature in the next article.

difficulties, please be aware that at the time of writing one of the lifts at Bolton station was out of action but it should be fixed by the time of publication.

The Northern Mill Engine Society welcomes volunteers to help on the engines. There is plenty to do and a well-equipped workshop.

GETTING THERE

Bus 125 runs every ten minutes on weekdays from Bolton Interchange to Preston Hospital. The journey to the museum takes about ten minutes. Bolton railway station is well connected and linked to Interchange bus station by a walkway.

In the next article I will describe a remarkable vertical cross compound and two different types of horizontal engines more typical of northern mill engines at their peak, **photo 14**. ●

The Melbourne Society of Model & Experimental Engineers presents our

100TH YEAR CELEBRATION 2026



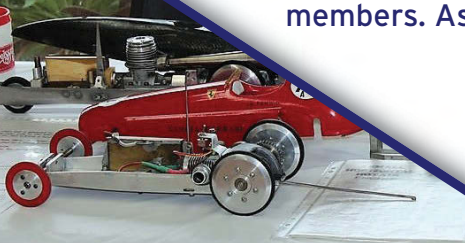
SATURDAY 3RD - SUNDAY 4TH OCTOBER 2026

SOUTH OAKLEIGH COLLEGE, BAKERS RD, SOUTH OAKLEIGH, VICTORIA, AUSTRALIA

This year we invite you all in celebrating Melbourne Society of Model & Experimental Engineers Centenary 100th Anniversary! To mark such a historic event, our exhibition will be hosted over two full days, back to back. We hope to see you there.

Use our website to get in touch if you'd like to exhibit models from past club or family members. As for our centenary, we hope to feature earlier work alongside today's latest creations.

To keep up to date with further information, visit our website or Model Engineer & Workshop's website.



At this time, we would also like to recognise and celebrate 51 years for the Australian Antiquarian Horological Society and 42 years for the Melbourne Meccano Club Inc.



POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

PostBag is one of the most popular sections of the magazine - readers want to hear from you! Drop us a line sharing your advice, questions or opinions. Why not send us a picture of your latest workshop creation, or that strange tool you found in a boot sale? Email your contributions to neil.wyatt@kelsey.co.uk.

TOOLS FROM THE MAGAZINE

Dear Neil, in Postbag (*ME&W* issue 4777) you asked "What tools have other readers made from, or been inspired by, designs in *MEW* or *ME*?" In my case there are many, but the ones below are used almost daily.

L. C. Mason's universal lathe tool holder from the January 1970 issue of *ME* is simple to make and, in my view, an elegant alternative to the seemingly ubiquitous quick change tool holders. More recently, I built a modified version of the power hacksaw from *MEW* issues 111 and 112 of 2006. This machine won't win prizes for speed, but it certainly does the job while I get on with something more interesting instead. Finally, an adapted version of the drill press clamp and sub-table from *MEW* of January 2019 has made clamping and drilling stock much more accurate.

In the less frequently used category I would add another L. C. Mason design, his dividing attachment from *ME* issue 3385 of 1970 as referenced in Tubal Cain's book, *Milling Operations in the Lathe*.

What do these all have in common? Uncomplicated design, ease of construction and satisfaction in use.

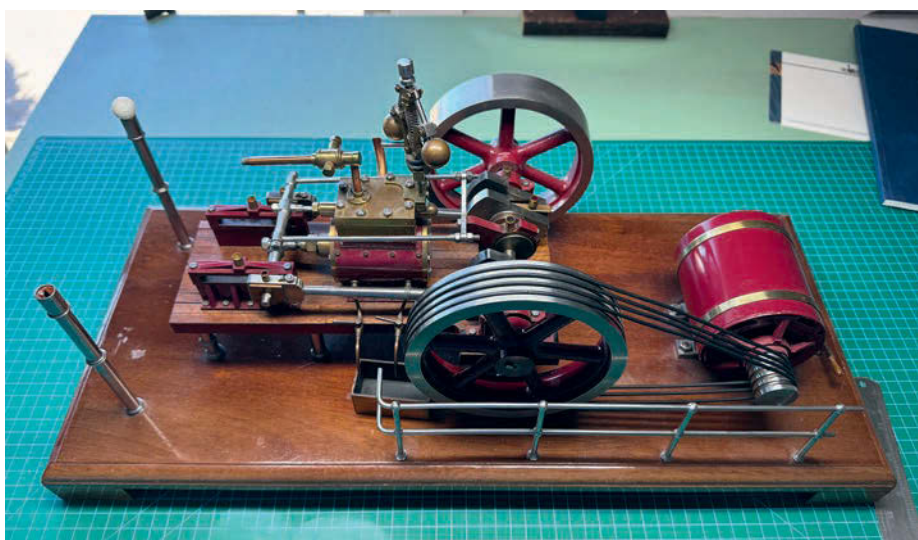
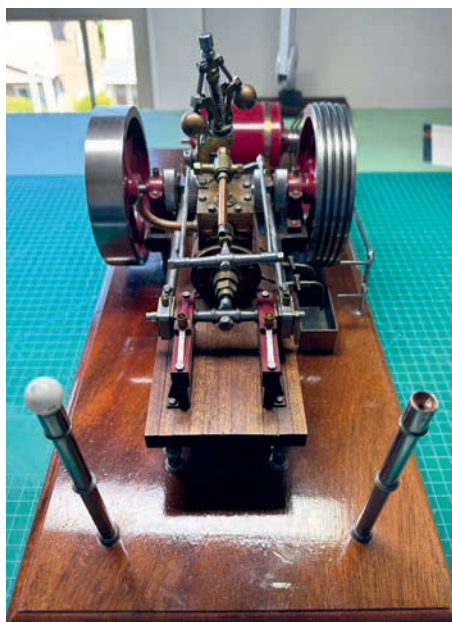
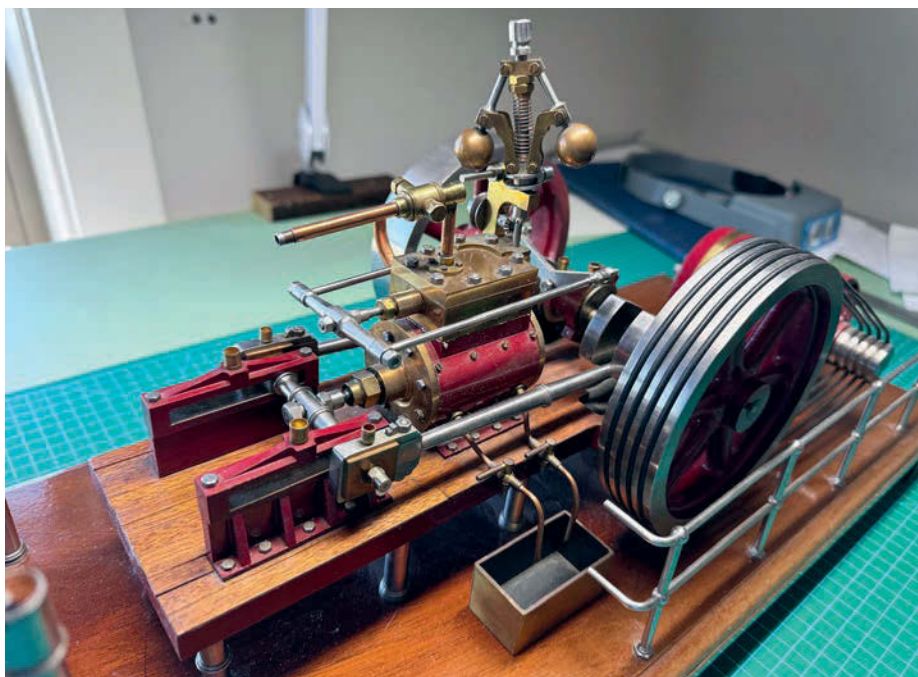
Ian Fisher, by email

STAN BRAY'S BRUNELL

Dear Neil, I see in July's Postbag that you made a request for any photographs of Stan Bray's Brunell steam engine. I have attached a couple of pictures of the model I made some 20+ years ago when I lived in the Channel Islands.

As you will see, it unfortunately suffered a bit of damage - the governor was bent during the move to the US, and I have yet to repair it. I had set it up so that when it was under steam I could throw a lever and it drove an electric motor to generate electricity and light up the bulbs, one of which was broken in transit, in the lamp standards. I hope they may be of some use to your reader. Unfortunately I do not know whether castings are still available.

Rod Crowte, USA

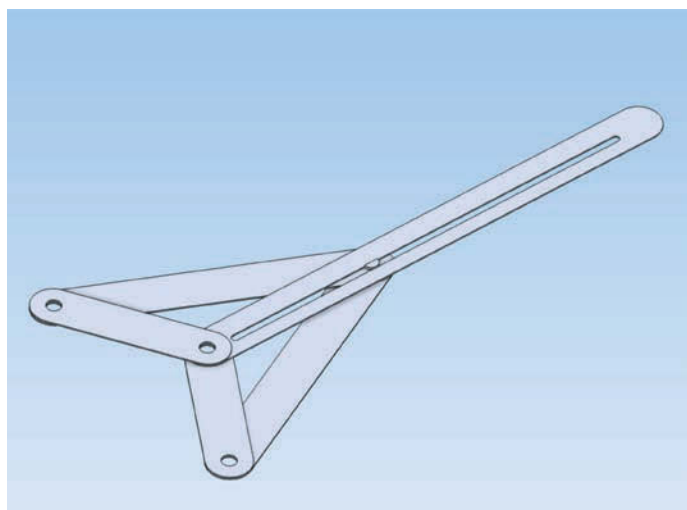


WORKSHOP CHALLENGES

Hello Neil, I refer to the above piece on page 65 of July's ME&W, in particular to "A device to help with marking out a line that bisects any angle, without having to measure the original angle". Could you clarify the background, please? If the original angle is entirely visible (e.g. marked out on a plane such as a sheet of metal) then a bisecting line can be drawn by a "ruler and compass" construction that would have been familiar to Euclid. I would be mildly astonished if this construction were not generally known. On the other hand, if this is a need to draw a bisector within an angle formed by two plates standing on a plane, these plates having side surfaces that are orthogonal to the plane, then I can suggest a device that would provide two pop marks on a line bisecting that angle.

Rhys Owen

The challenge I had in mind was bisecting two plane surfaces. Rhys and I shared ideas, and we've come up with the illustrated device, that I sketched in Alibre. Rhys notes that it needs something added to stop the device slanting away from the axis of symmetry - Neil.

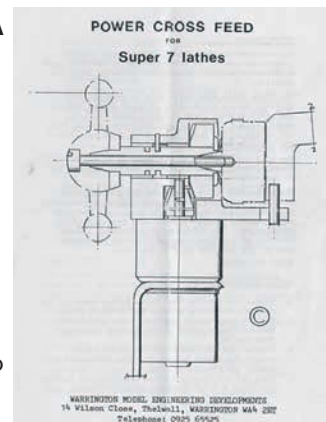


POWER CROSS FEED FOR A MYFORD

Dear Mr Wyatt, I haven't used my lathe since moving into my current house some years ago, but am thinking of setting it up again. I wonder if *Model Engineer & Workshop*, or either of its predecessors (I've got plenty MEWs from before the amalgamation), ever published an article (most likely in several parts) to upgrade a basic Myford ML7 (or a late model Zyto 3.375") by the addition of a powered cross slide.

If so, please would you let me know how I should go about obtaining a copy of the article(s). If there was such an article, do you know if any small foundry or model engineering company assembled a kit of parts to work on?

John Richardson, by email.



I'm not aware of a kit of parts, but there was a device sold many years ago from Warrington Model Engineering Developments that sometimes comes up as a used item. Perhaps a reader can help track one down for you? - Neil.

DISPOSING OF A WORKSHOP

Dear Neil, I'm pleased that readers still find my article about workshop disposal helpful. It's a serious subject that will affect us or our families one day.

The article was written some time ago. If readers have information or relevant experiences - good and bad - that can update it, please let me know and I'll revise the website information.

I'll be particularly interested to know if any clubs or societies have officers who help members dispose of workshops.

My email is arbe1950@googlemail.com .

Roger Backhouse, Yorkshire

Model Engineers' Workshop Article Index

DATA to June 2012
Copyright © Colin Usher, 2012 Chicago Lathe Book
Doris Pittman Colin Usher

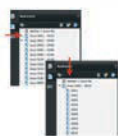
The spreadsheet based index compiled and hosted by Colin Usher at www.colinusher.co.uk has been an invaluable resource for hobby and model engineers for many years. Unfortunately, as of July 2012, Colin has no longer been able to update the index.

How to navigate this index

This document is divided into two sections. The first is ordered by issue number and the second is ordered by the contribution name (where known). If you enter the issue number, click on the small triangle towards the first word bookmark.

For example: If you want to go to the page for Issue 1, go to the bookmark 0001-0001 and click on the small triangle to the left to open it up. Then click on Issue 1.

If you want to see the article not ordered by author click on the second section. This is arranged in a similar way but alphabetically by name.



DATA and Amendments from July 2012
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Alternatively, you can use the word / phrase search box.

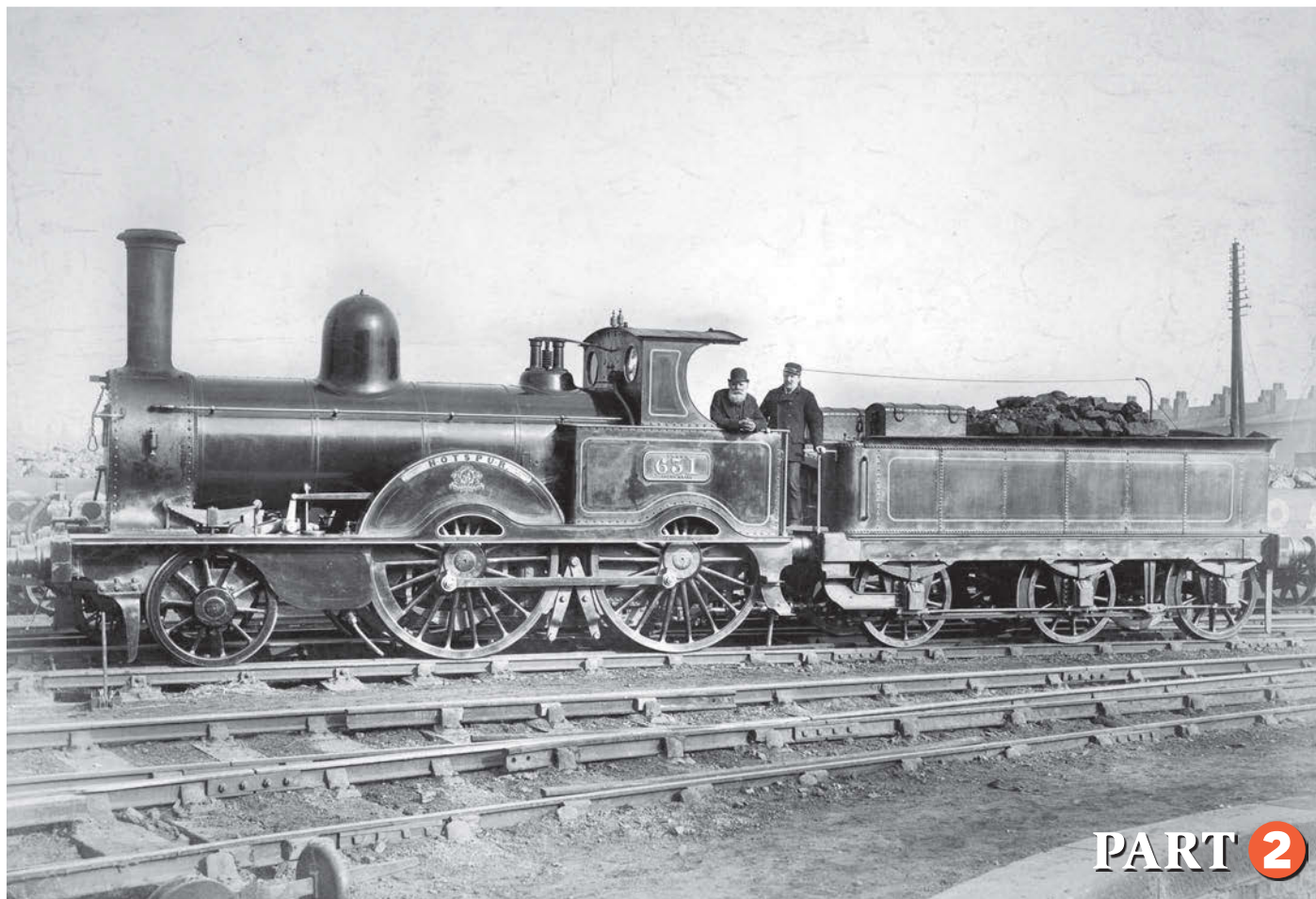


ONLINE INDEXES

David Frith prepares the indexes for *Model Engineer & Workshop*. The latest copy can be downloaded on from the Forum at www.model-engineer.co.uk - just select Forums and then the Model Engineers' Workshop topic. Alternatively scan the adjacent QR code.

If you prefer the paper indexes, don't worry, David continues to produce these as well.





PART 2

Samson

Chris Rayward explains the crankshaft for his 5" gauge early L&NWR **Samson** Class 2-4-0.

There are several aspects to machining the parts for an internally cylindered engine with valve gear eccentrics between the webs so the tasks will be tackled in a simple order. My copies of the early locomotive drawings showed that the crankshaft webs had been given a large radius on their ends as opposed to a full radius as on most early prototypes and the overall construction details are given in my **fig. 1**. The first requirement, however, is to make two plug gauges with a good finish which will be used to bore the holes for the alignment of the webs. Mild steel is required for the centre section of the crankshaft on which to mount the eccentrics and initially this material can be adopted for the first gauge which needs to be 0.562" in diameter. It can be turned down from a length of 5/8" material to be around 2 1/2" long. The mild steel is used as there is no rotation involved and the grub screws that will secure the eccentric sheaves will bite into it and hold them fast. Do not separate

it from the parent stock bar at this stage, as before actually being used for the crankshaft assembly, it will be a machining check gauge for the two separate pairs of webs. The second gauge is also needed for the eccentric shaft bores in the webs, and this can be from any 1/2" diameter steel and reduce it by a 1/32", as shown on my drawing. My **photo 6** shows the two gauges. Assembly notes for the shaft have been added to the drawing.

MACHINING THE WEBS.

As the crankshaft is fabricated, four 8mm thick laser cut steel blanks, which are usually supplied from black steel, were obtained for the assembly. The first task was to clean off one face on each of them so they could be 'tinned' with soft solder before joining them together as two pairs. Previously, my task was carried out laboriously with coarse grade emery tape but this time, use was made of a linisher – what a joy! To begin the preparations, first coat the bright

faces thoroughly with the necessary flux for soft solder and only a gentle heat is needed to raise the surfaces to the melting point. The flux will come to the boil as the metal heats up. Spread the solder as evenly as possible and do the task on a piece of heat-resistant material, then carefully bring the pairs together with them standing up on one edge. To ensure the pairs are straight and true, use two sturdy square blocks of metal at the sides and the ends to



Photo 6: The two gauges for the boring operations.

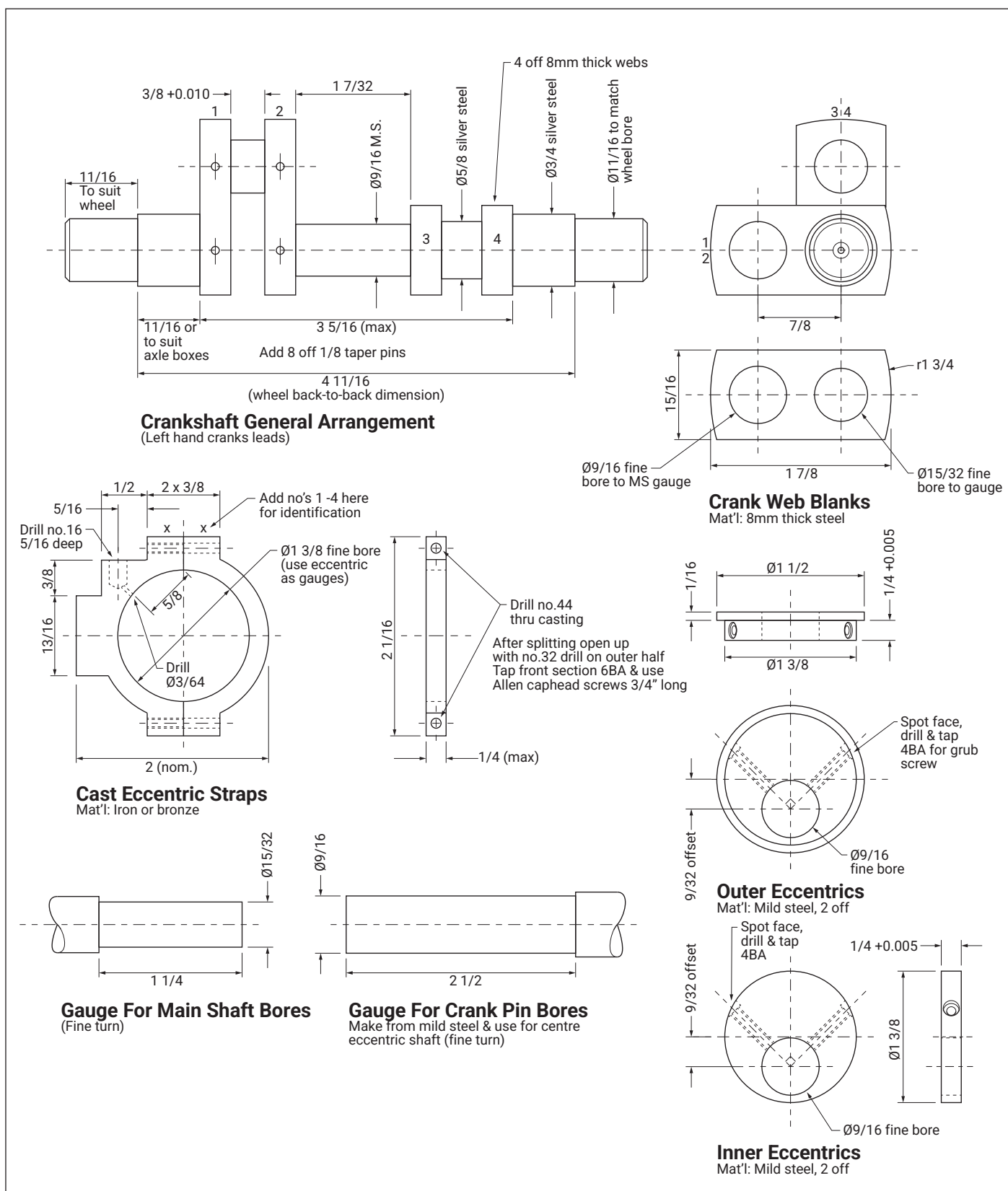


Fig 1: The details for the crankshaft.

help bring them into line. Gently hold the joint together and do be patient and let each pair cool down before handling them, then thoroughly clean off all the flux and dry them.

As is usual, my blanks had been marked where the centres of the crank throws should be. Rather than

making two centre 'pops' and adding a No. 2 centre by hand ready to set up each pair in the lathe, my method is to locate the pairs of webs by just using a pointed lathe tool on the top slide and the centring is done with identical readings on the cross-slide dial. Touching each side of the web

with the tool point will quickly show which way to adjust the chuck jaws and for the axial distance use whatever setting reading is obtained at the sides, plus 1/32" down from the curved end. At this point the drilling and boring operations can take place with the gauges already made. Each gauge



Photo 7: A bored pair of crank webs with their gauges.



Photo 8: Drilling and machining the eccentric bores.



Photo 9: Using a mandrel to machine the sawn faces of the two outer eccentrics.



Photo 10: Holding the shouldered pair of eccentrics in the lathe is simpler.



Photo 11: The four completed sheaves on their shaft.

should be a good sliding fit in each bore; use plenty of cutting oil for the drilling and boring tasks. I do not favour a reamer for finishing the bores as a drill can wander off the centre line and the reamer will take the same route. If a reamer is preferred, only use it when the boring operation has trued the hole and there is a minimum of material to be removed, but the gauge must still be a good sliding fit. When the first hole has been done, re-mount the pair of webs to carry out the similar task for the second bore. Before re-heating and splitting them apart for a thorough clean, mark one curved edge of each web adjacent to the outer crank pin holes with numbers 1 to 4 in a left to right sequence for the future order of assembly. **Photograph 7** shows one pair of webs with the gauges in place. Once both pairs of webs have reached this stage, set them aside and the eccentrics can be machined next.

MACHINING THE ECCENTRIC SHEAVES

Here a length of 1½" diameter mild steel is used as the straps for the eccentrics should be of either cast iron or bronze. Set up the bar in a 4-jaw chuck as accurately as possible and clean up the outside diameter before turning the material down to 1 3/8" diameter

by a generous ¾" long for the two inside sheaves. It is not really feasible to part-off these parts so mark the centre with a 'V' tool and hacksaw off the double length item a good ¾" long and it can be reversed in a 3-jaw chuck to face off the newly sawn end. Do not split these two parts just yet. Return to the parent material and machine the short shoulders on each end of the stock to be just in excess of ¼" for the two outer eccentrics and here they can be hacksawed off the bar. This time the two parts can be held lightly in a 3-jaw chuck to face the sawn ends to thickness.

The completion of the eccentrics requires them to be held in the 4-jaw but offset to bore the holes for their axle. Taking the double length part first, it is convenient to scribe the diameter across the sheaves and roughly mark where the axle bore should be to aid a visual check, but if the lathe tool method is used again to set the offset accurately, the diameter mark should be positioned in-line with two of the chuck jaws. Hold the material quite lightly at this stage and packing should be added later too. For the right result the difference in the cross-slide readings needs to be 9/16", so zero the slide dial with the lobe of the eccentric towards the front and then rotate the lathe 180 degrees and

check the slide movement till the right measurement has been achieved. Also check the readings each side to ensure the material is centralised. This can be a surprisingly quick method and very accurate but check again after some pieces of brass packing have been added all round. When all is correct, drill and bore the eccentrics to suit the centre axle plug gauge and then do the same for the shouldered sheaves. **Photograph 8** shows the set-up to machine the bores.

Separate the twin sheaves and mark out the intended direction of the tapped holes at 90 degrees for the grub screws into the axle holes on the sawn face. Hold down both the parts individually on packing onto their machined faces on the lathe top slide and using a small drill in the lathe 3-jaw chuck, align the scribed lines with the drill so it is aiming at the centre of the sheave diameter. A 3/16" slot drill is then used to carefully cut a seating for the required centring and tapping drill operations. The holes can now be centred and after drilling into the centre, the holes can be threaded 6BA with a set of taps in the bench vice. Once the two holes have been tapped and two holding screws added, a simple mandrel can be used to face the rough side of the sheave as shown in **photo 9**. Face the sawn edges slowly and carefully machining off not more than 0.010" of material at a time to achieve an overall width of just over ¼" and the pair are ready for assembly. The boring of the two outer sheaves is simpler, and **photo 10** illustrates the holding technique.

Adding the screw holes for these two end sheaves follows the same process but adjust their height on the top slide accordingly for the hole spotting process; **photo 10** shows the four parts mounted on their shaft.

Next time I will continue with the machining of the eccentric straps and the assembly of the shafts.

to be continued

3D Printing in the Home Workshop

Alan Bryan gives more examples of how a 3D printer can change your life, or at least, your hobby.

PART 2

Returning to the subject of ball ended handles, I had another challenge that required more plastic assistance in the form of a variation of the spider principle.

Carrying on from machining the tapered transition surface between the balls, the next stage is to machine a flat and drill and tap holes in the large ball end of the handles. The flat comes first and sets the angle that the axis of the handle shaft describes to its interfacing surface. To do that, the large end of the ball has to be gripped firmly in the chuck with the axis of the tapered section set to an angle of 70 degrees to the lathe axis. Professor Chaddock and the late George Thomas (GHT) worked out that one could use a special split collet made to specific dimensions which control how far the large ball sits into the chuck jaws when using a Myford lathe. If one follows the instructions, on that lathe, or one with the

same sized 3 jaw chuck and if the small ball is contacting the face of the chuck body, it will enable the clamping flat and the hole to be drilled and tapped to be machined into the ball so that the shaft of the handle raises upwards, away from the clamping face, at 20 degrees, see photo 9 in the previous instalment for the set up.

The established procedure works perfectly for the two original sizes of ball handles that the Prof designed but it quickly occurred to me that for a smaller, much shorter handle, the larger ball end would be situated far back inside the chuck shrouded by the jaws, thus preventing tool access to machine the flat. Further, one couldn't position the ball at the end of the jaws and use packing between the ball and chuck face because that packing couldn't be retained when the chuck rotated. I did consider printing a plastic pad with a magnet embedded in it



but decided that it could fly out when rotating. Eventually I decided to use a spider of the correct thickness, located by the chuck jaws themselves which couldn't fly out due to centrifugal force. I modelled and printed a special one of the correct thickness and in practice it worked splendidly, **photos 13 and 14**.

A DTI HOLDER FOR EACH OF MY LATHES.

These proliferate on the internet. On eBay you can buy ones to clamp into a four-tool turret or even some to fit



Photo 13: Machining the flat on one of my larger ball-ended handles.



Photo 14: The special spider in use machining a flat on an M4 ball handle.



Photo 15: Dickson Compatible-DTI Holder for Colchester Master 2500 Lathe.



Photo 16: Dickson Compatible- DTI Holder for Myford Super 7 Lathe.

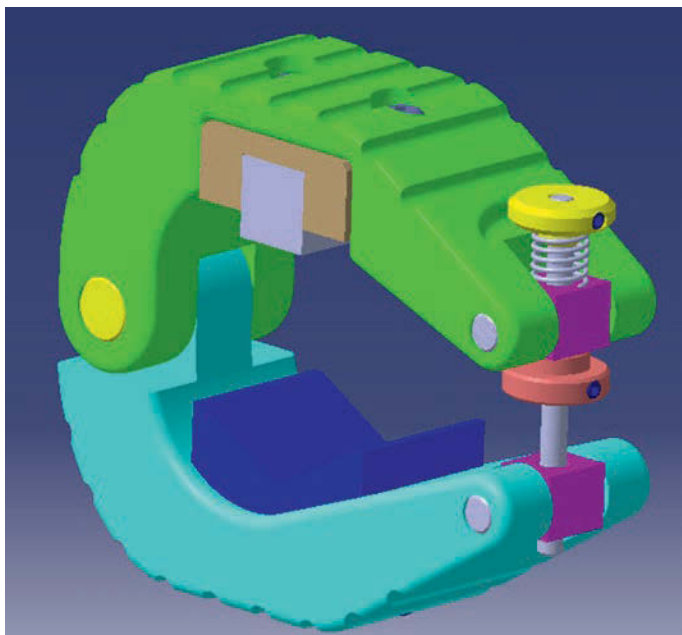


Photo 17: Screen grab of CAD model of the Delapena style external hone.



Photo 18: The 3D printed external hone in use.

the Dickson type of Q/C Tool posts of assorted sizes. But why buy one when one can make them? These were some of my earliest attempts at using the machine and results varied depending on the way that I orientated the part in the printer.

Eventually I made three, one for the small Dickson on my Super 7, one for the larger Dickson tool post on my Colchester Master and one to mount in a friend's four-tool Myford turret, **photos 15 and 16**. I had a DTI ready to mount into both holders and now

it's only a matter of a minute to fit the dedicated attachment to my Dickson equipped machines and I'm set to go. Highly recommended! All function well, but with the benefit of hindsight could be improved so I will redesign and remodel them one day.



Photo 19: Screen Grab of the four Change Wheel Storage Posts

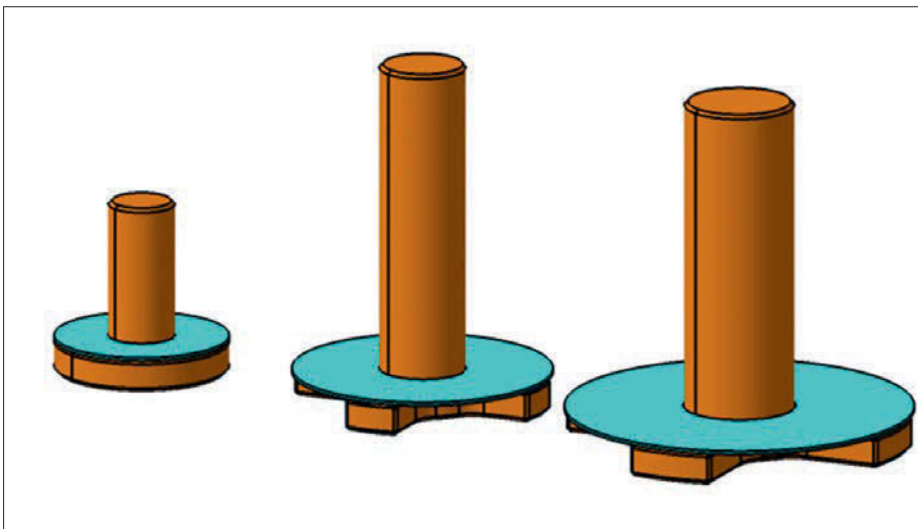


Photo 21: Milling and slitting saw-storage posts and separators.

A DELAPENA TYPE OF EXTERNAL HONE

You may have seen my article for this (*ME&W* 4772), so I won't go into it too much here. Suffice it to say, I was able to quickly produce a tool that efficiently enabled me to accurately size shafts to fine limits, **photos 17 and 18**.

CHANGE WHEEL STORAGE POSTS

My Super 7B has a screw-cutting gear-box so change wheels aren't usually necessary unless I'm doing something special threading-wise. I do though, also possess a full set of change wheels, having bought most of them second hand a lot of years ago, plus a few more to enable me to cut metric threads on an imperial lathe. They live in a drawer in the cabinet next to the Myford and I wanted to be able to keep them altogether using as small a drawer base area as possible. These posts, **photos 19 and 20**, use the space more efficiently thus achieving that aim.

CIRCULAR MILLING AND SLITTING SAW STORAGE POSTS

These are a variation on the change wheel storage posts idea, **photo 21**. I didn't invent them, but I didn't copy anyone else's either. The post on each replicates the diameter of the milling arbor that each cutter or saw fits to and the cutter is simply dropped on to it. Mine are nominally $\frac{3}{4}$ ", 1" and 1 $\frac{1}{4}$ " diameter and are moulded hollow to minimise material usage. I used 130grms of PLA for the lot. I also printed thin spacer discs as well to prevent the cutters rubbing together. Again, efficient use of space that is always at a premium in a home workshop, **photo 22**.

MILLING CUTTER AND OTHER CYLINDRICAL TOOLING STORAGE

I like my cutters, drills, taps etc. to be stored so as to be readily accessible and easy to select which, prior to



Photo 20: The convenience of the storage system

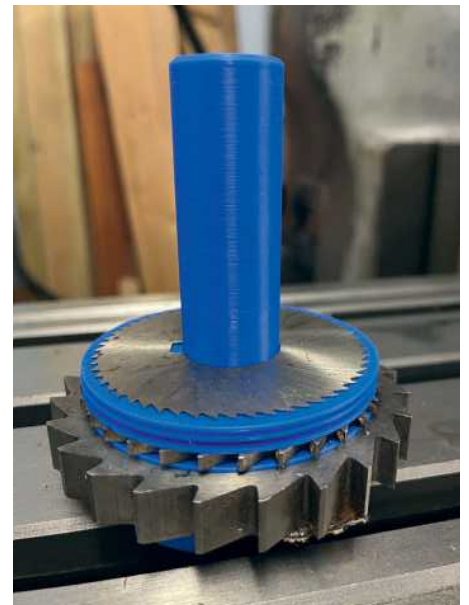


Photo 22: Stacked and separated storage.

performing this design exercise, wasn't easy to do. All were stored in drawers, separated according to size and thread system, in boxes or wrapped but it was time consuming to select one because these days I sometimes find it difficult to read the sizes etched onto the cutter shanks. CAD once again enabled me to devise my variation of a system to store cutters of all sorts, **photos 23 and 24**. Each cutter or tap plugs into a block with its size showing next to it and 3D Printing allowed me to realise it. I make no claims to have invented the system. Jobbers' drills, taps, countersinks etc. have been available as sets since the year dot, standing in die cast blocks with each size cast into it. I'm sure that we've all spent hours, patiently drilling

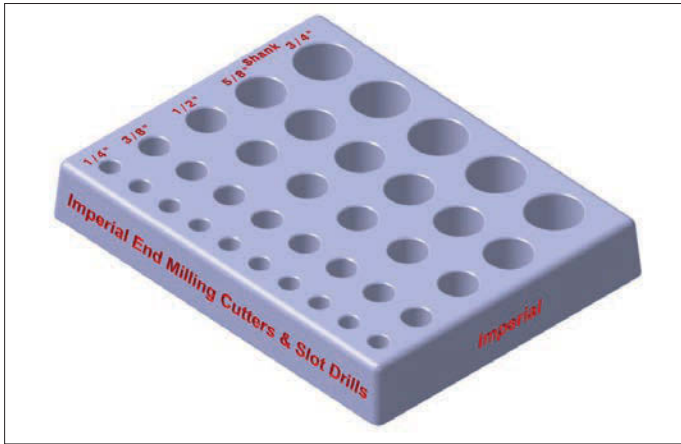


Photo 23: Screen grab of an end mill storage block.

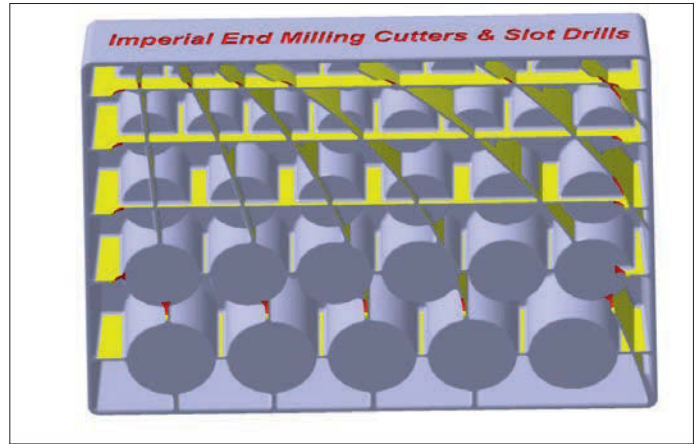


Photo 24: Storage block underside.



Photo 25: Imperial milling cutter blocks.



Photo 26: Metric tap and die storage block.

many different sized holes into blocks of hardwood to perform the same function. I've saved time and improved on that by modelling and printing dedicated storage blocks for my taper shank drills and reamers, end mills, centre drills, countersinks, straight shank reamers plus taps and dies, **photos 25 and 26.**

I have blocks for Metric 1 Morse Taper drills and another for that taper size in Imperial also, **photos 27 and 28.** Number 2 Morse Taper drills in Imperial and Metric are treated similarly as is

Number 3 Morse Taper. All Morse Taper tools are mounted by plugging the taper into the block.

For Imperial Reamers I have a similar system 3D Printed with the size printed next to the socket. For my Metric Reamers, instead I have printed blocks with a depression moulded in alongside each socket to take a sticky label from a Brother Label Maker with the size printed on to it. My reasoning is that Metric Reamers are available in 0.1mm diameter increments so there are more reamers available for each shank size than there are Imperial sizes. I'm unlikely though to ever own all of them so my storage facilities are presently catered for with one block. If though my stocks grow and need to store more than I have sockets for I can simply print another block and print more labels.

COUNTERSINK BIT STORAGE BLOCK

Small but effective, **photo 29**, by using a hollow design, **photo 30**, it took less than 23g of filament to print and prevents the previously loose tools from rolling about all over the

place. I can take it to the drill press or the lathe and select one to do the job, then return after use to the cupboard from whence it came with the contents all accounted for.

For Tap and Die storage, each block is dedicated to a specific thread form and/or system. Imperial, encompassing BA, BSW, BSF etc., or metric covering Metric Course and Fine etc.. One block each for BSW and BSF up to 3/4." One for British Association OBA to 16BA. One for Metric from M1 to M18. There is room in all blocks for five taps of each sized thread: taper, second, plug, spiral point and spiral flute, plus a die of each size, **photo 31.** I've also modelled and printed separate blocks for my Model Engineers Thread Taps and Dies; one for 32 TPI and another for 40 TPI. I will eventually get around to doing blocks for my Unified and BSP threading equipment although I don't have a lot of those tools yet so it's not a priority.

Each block has the range of sizes of the threads it contains clearly printed into the front face of it so it's obvious which block is which even if the blocks are stored on a shelf above eye level. The sizes 3D printed into the top face next to each row of taps and the link line between the last tap in each row to the die next to it make it easy to ascertain if a tap or die is missing or broken. Thus stock control becomes easier than it would be if all the sizes were stored as they previously were in drawers and boxes.

OK it takes time to do the modelling but not an excessive amount. I can say from experience that the design and modelling time is overall less than the time taken to produce the alternative neat option of holes drilled and slots cut into a block of wood. Then, once I've done that, I run each print overnight.

I've also 3D Printed a storage rack for all of my R8 collets that occupies an area of 210mm square on the cupboard



Photo 27: Number 1 Morse Taper shank imperial drill storage.



Photo 28: Underside of the storage block.



Photo 29: Countersink bit storage tray.

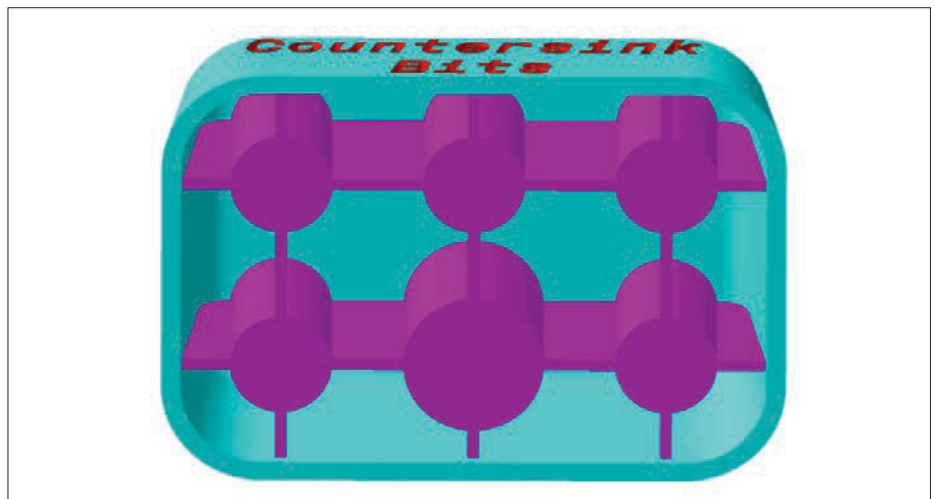


Photo 30: Screen grab showing ribbed underside.

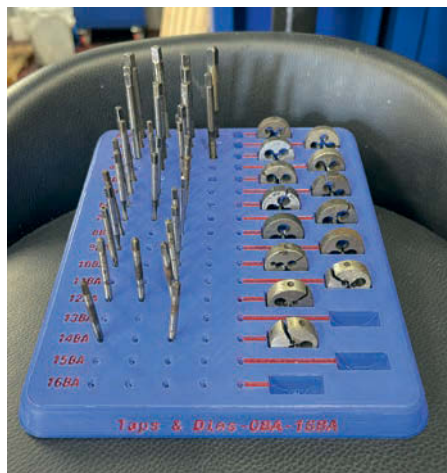


Photo 31: BA tap and die storage.

shelf. Each collet has its size printed into the top surface next to it.

Each CAD model is parametric thus making the modelling process quicker. Once I've produced one model, I usually produce another for a different thread form by saving it under a different name and modifying it to feature more or less slots of sizes to suit the

range. Obviously, the text changes also from that of its predecessor but all of that doesn't take long to do. It is much quicker than it would be to remodel each new one from scratch.

Each block consumes roughly between 0.3KG to 0.5KG of filament and a print can run for up to twelve hours or overnight. The maximum size of each block's footprint is governed by the build volume of my printer which is 220 x 220 x 250 but I try to keep their footprints to 200mm square maximum.

I design each part to minimise and conserve material as much as possible, so each block is hollow and webbed internally like an injection moulding rather than being a solid mass of plastic.

To produce the text in the CAD model, which is printed into each block, I model the text letters as a solid body. I then subtract that solid body from the surface that it needs to appear on by using a Boolean Operation, thus presenting recessed text 0.3mm deep.

My printer only prints a single colour at a time so to colour the text and the link lines to the die slots I've tried several methods of doing it. All

involve filling the recesses created with nail varnish. Application needs to be accurate and firstly I tried to do that by painting into the recess with a fine brush and cleaning the excess off by wiping with a rag soaked in acetone. That wasn't an ideal method because I couldn't regulate the amount deposited easily. A close study of the photos of my earlier prints, which include the Morse Taper storage blocks, will show a degree of red bleed-off and local bleaching of the substrate caused by the process used to clean off the excess. Then I hit on the idea of using a syringe, which offered to allow a more precise means of depositing the liquid. To do that I carefully fill each recess to the brim with colour, using an Optivisor magnifier to see what I'm doing, and leave it to dry overnight. That method has produced zero excess run-off and has reduced the consumption of the nail varnish significantly. I use red for Imperial tool blocks and a whiteish colour for Metric. It's fiddly to do but the results are worth it. The syringe can be easily cleaned out with acetone and is reusable many times afterwards.

To Be Continued

If your hobby includes any aspects of engineering, the **ME&W** will have much to interest you in its pages. Bigger than either of its predecessors it has the space to cover all aspects of model engineering from traditional live steam models to gas turbines, from clocks to toolmaking. We look in depth at the skills you need to get the most out of your hobby: using maintaining and improving lathes, mills and other workshop machines such as 3D printers and CNC. We also cover the widest range of workshop activities – traditional ones like casting, brazing and welding to modern skills like using embedded electronics. Finally, we keep you up to date with what's happening in the world of hobby engineering with our event reports, news features and reviews.

Neil Wyatt

Editor

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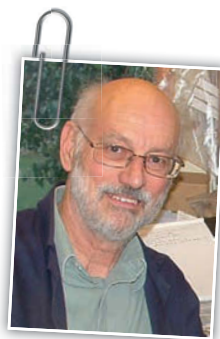
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This month **Doug Hewson** makes the Operating Gear for the Ashpan and Rocking Grate.

PART 30

Dear folks, Eddie Gibbons (who has custody of my 4MT) and has just read my article, says that the firebars would be better reversed as with the three bars fixed at the rear of the firebox. It would make cleaning easier following dropping the fire. I would certainly advise doing that. Everything else would stay the same as drawn.

Moving on, the operating gear for the dampers should be available from The Steam Workshop. These include the main casting which accommodates the turrets for the screws which operate the dampers and the hand wheels and other bits and pieces. These will need threading 5BA. I use my 5BA tap and die for all sorts of jobs and similarly I have always a good stock of 1/8 welding rod as it just threads 5BA. Speaking of which 3/32 welding rod just threads 7BA very nicely (I have some 1/16" TIG rods which are nice for 10BA, and being relatively soft they thread easily – Ed.)

There are two catches for the fire grate. One restricts the movement so that the grate can only be rocked a little way, like when you are trying to loosen an obstinate piece of clinker. Then if the centre catch is dropped over, the grate can be dumped into the ash pan. However, it is not a good idea to drop the grate into the ash pan so you must open the doors first, as the red hot ash could very easily distort the ash pan. Once again, I have made use of my photos of my 4MT as your 2-6-0 should look identical to this but with a slightly shorter firebox and boiler. The two catches are left and right in **photo 293** and the bar for operating them is stowed in its rightful place to the right. **Photograph 294** is the full size 80080 which actually shows the rocking grate catches a little more clearly without the clutter, and it also shows the checker plate surrounding the levers should be more or less identical. Anyway, what I am trying to get over to you is not to use any Durbar plate on locos which were built before 1962!

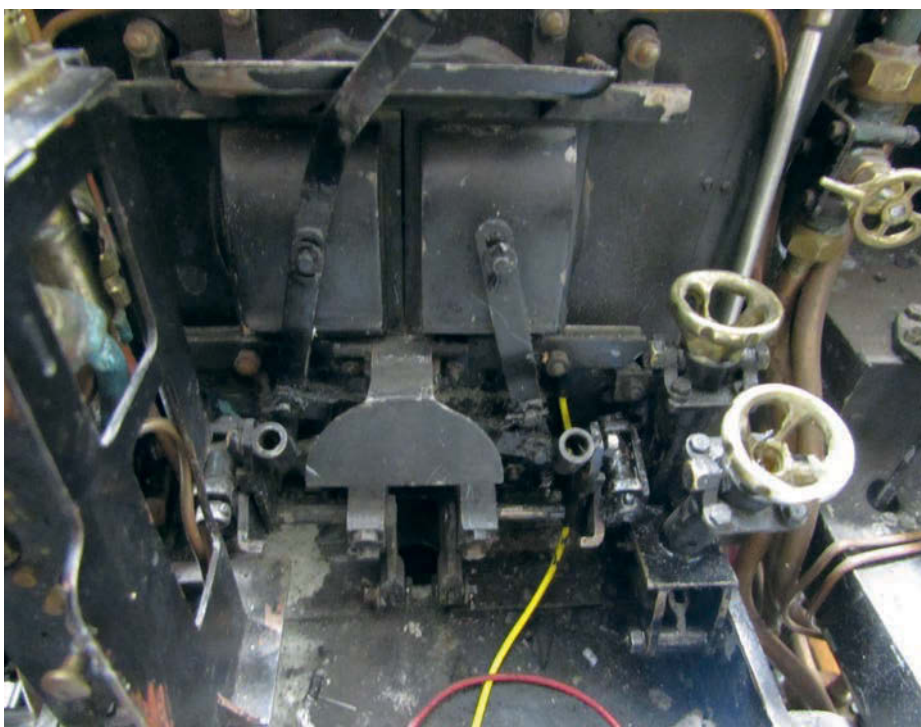


Photo 293: Fire grate catches on the model.

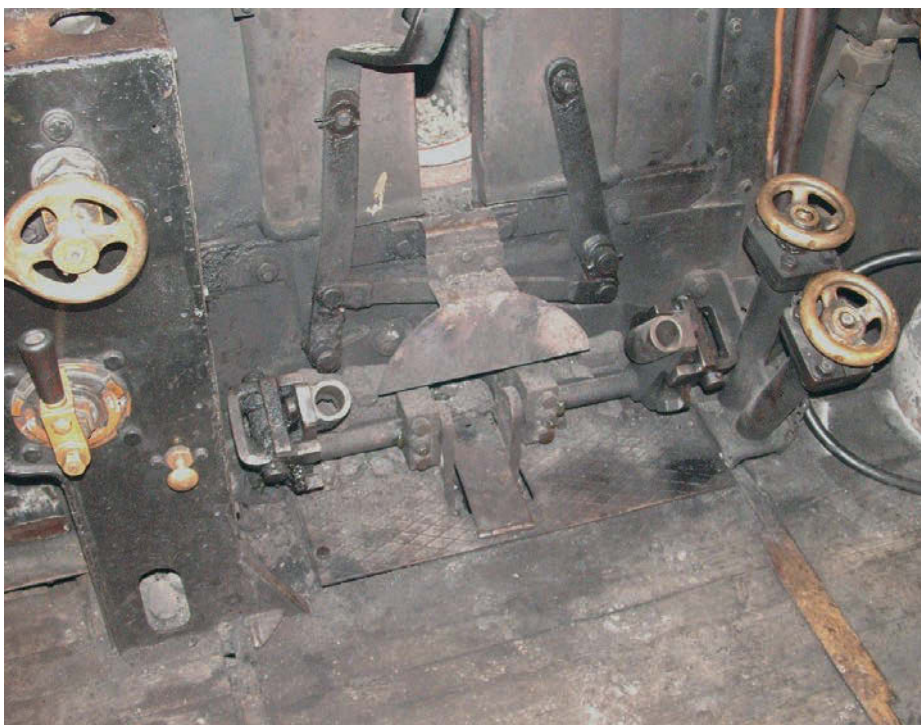
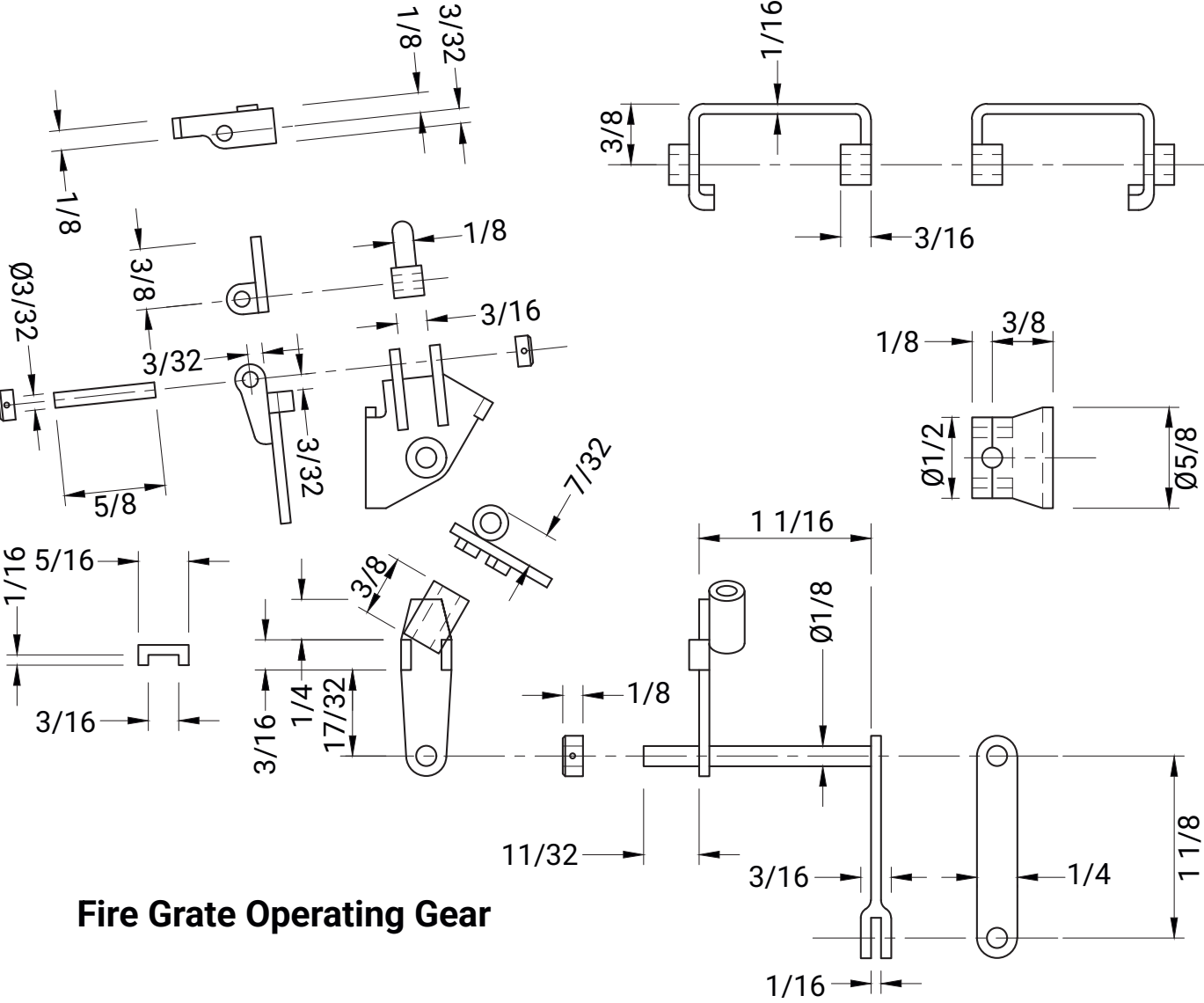


Photo 294: Catches on the full size.

Fig 118



Fire Grate Operating Gear



Photo 295: Silver soldering bracket.



Photo 296: Next stage.

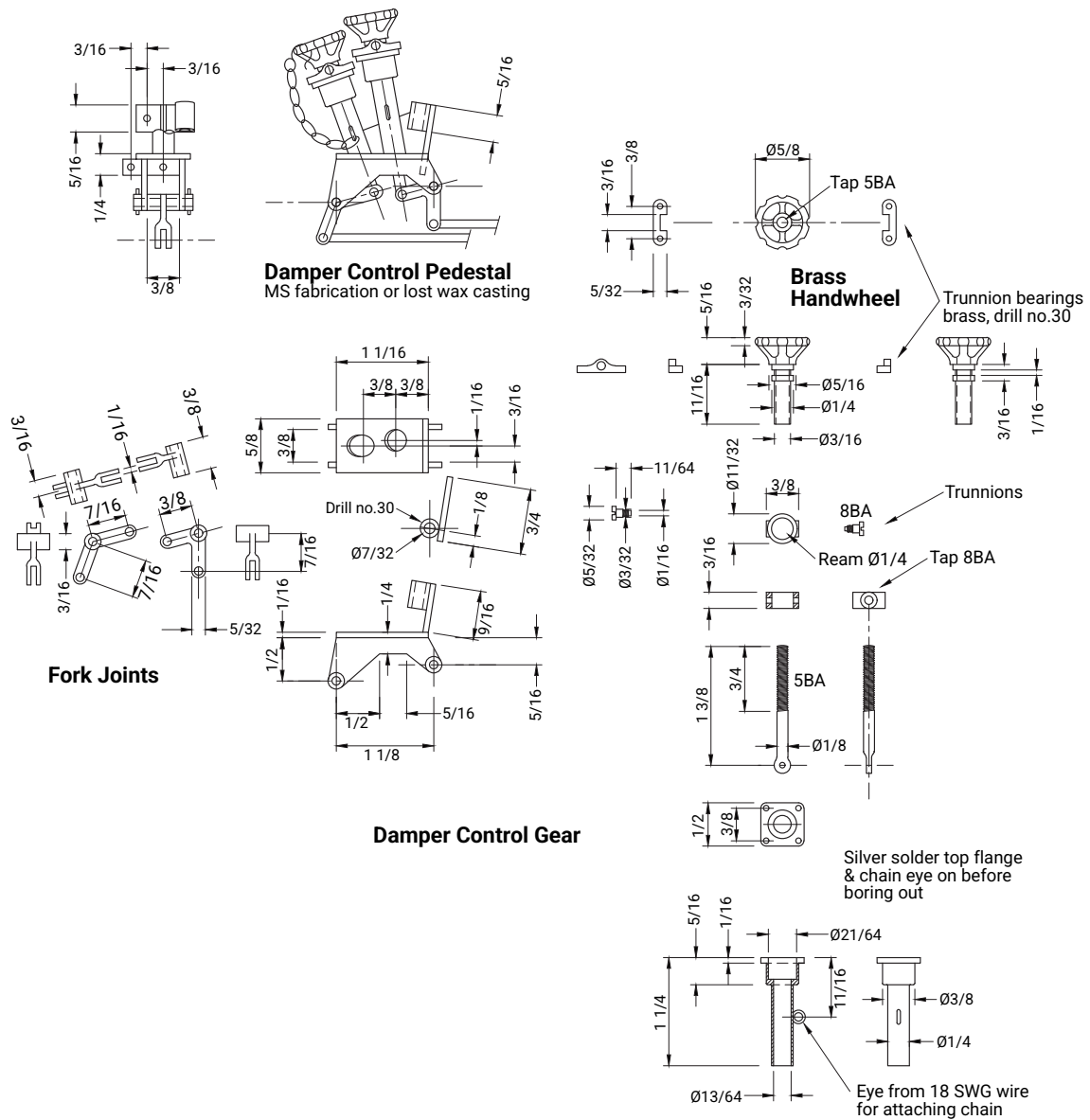


Fig 119



Photo 297: Finished, showing chain hooks.



Photo 298: Rear of boiler with these parts attached.



Photo 299: Finished cranks.



Photo 300: Grate locks from 16 swg sheet.



Photo 301: Part made lock.



Photo 303: Rear damper door; photo - John Arrowsmith.

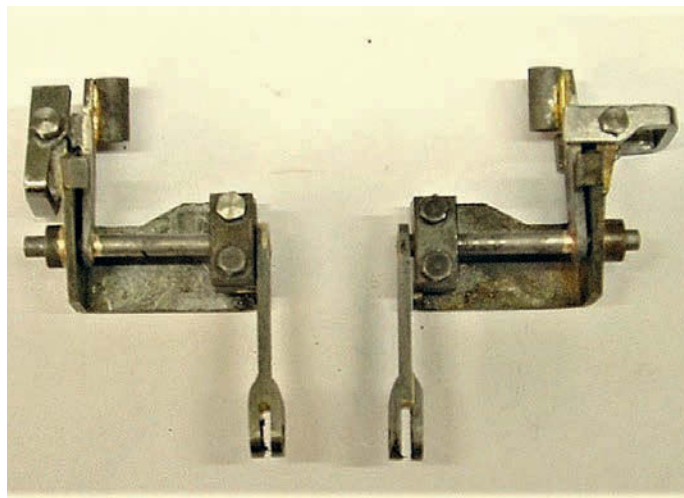


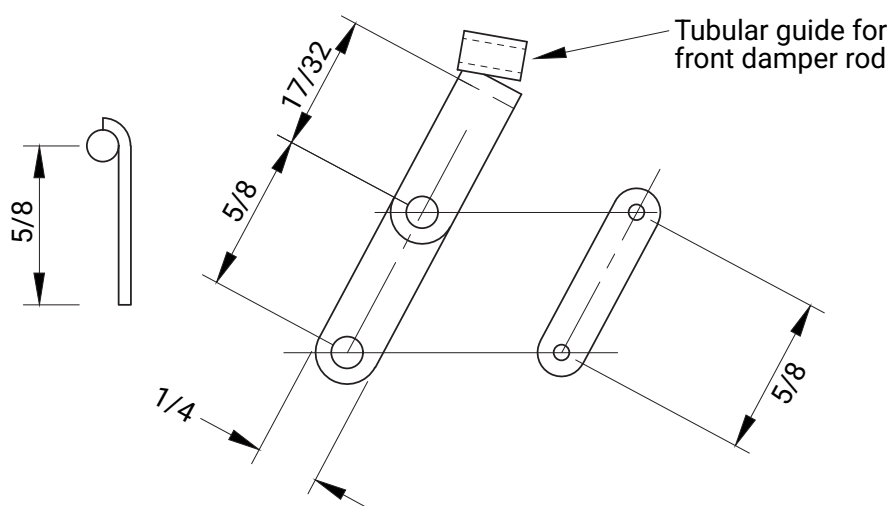
Photo 302: Completed brackets.



Photo 304: Front damper door; photo - John Arrowsmith.

I started by making the pair of U-shaped brackets so that I could build up the rest of the bits and pieces on to them, never thinking that they would become a set of castings. Beginning with **photo 295**, there are the plates which the two pedestals plug into, **photo 296** shows the bracket drilled with the two tubes ready for silver soldering. Note there is a piece of brass rod which needs drilling out No. 30 as this is where the operating rod resides for rocking the fire grate and it is also used for opening the ash pan doors. Important items are the rings to hook the chains on, they make sure that the dampers don't alter their settings from where you have set them, **photo 297**. They just need an S-hook on the other end so that they can be hooked into the handwheel. It just won't! **Photograph 298** shows the rear end of my boiler which is now complete with all of its fittings installed, ready to be lowered on to the

Fig 120



Damper Operating Crank Trunnions

chassis. Your boiler should look identical to mine at this stage. As can be seen, the gauge glass lamp is in place. The photo also shows the fire grate controls right at the bottom corner of the photo, if you can make them out. It also shows the yellow wire and that goes to my gauge glass lamp, which is very valuable, even on a dull day, but I will deal with that later.

To make the cranks I began with a piece of 1/4" round bar and then made use of some offcuts of 16swg plate and silver soldered them all together. **Photograph 299** shows the result once they were finished off. **Photograph 300** shows the pair of grate locks. Once again, it shows the two pieces of 16swg offcuts which required two sharp bends in each, note there are small turnover pieces to prevent the levers from over running.

Photograph 301 is the left-hand fire grate lock part made. **Photograph 302** shows the pair of brackets assembled and ready for mounting on the boiler. Note the left hand one shows the catch off, and the right hand one is on. Now, one thing I omitted in my efforts to impress people by copying David Bailey, was that I failed to take any photos of my ashpan doors, so I had to ring John Arrowsmith so see

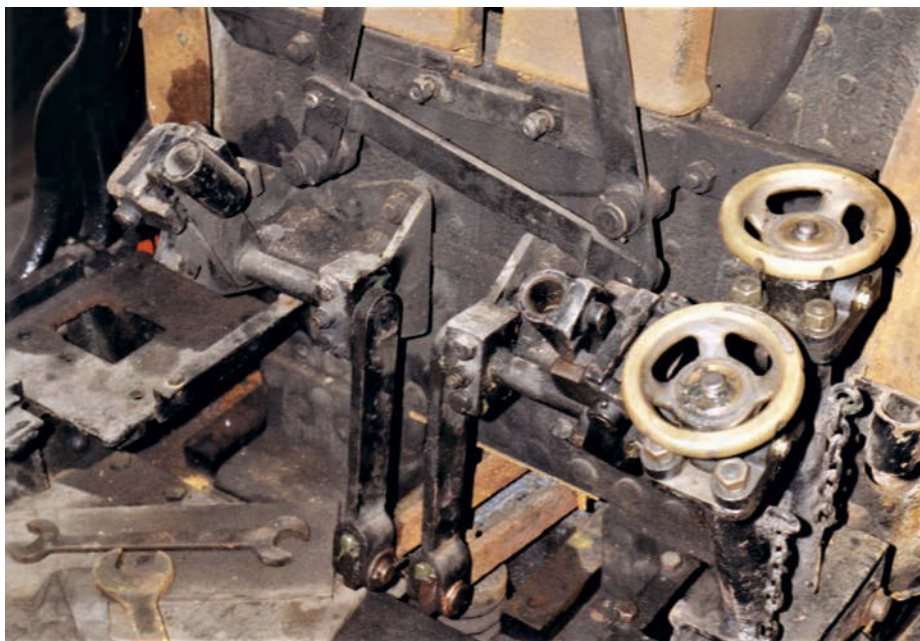


Photo 305: Another view of the damper gear on the full size loco.

he had any. He is building 80113 and so he provided me with the necessary, so the following two photos are down to him. **Photograph 303** shows John's rear damper door and the completed gear for operating the damper. **Photograph 304** shows the photo of John's front damper door,

once again with the operating rod attached. **Photograph 305** shows the same gear on the full size 80080 with both catches down and there are other things that you may recognise in this photo, I am sure. I reiterate, the layout is identical to your engine.

To be continued

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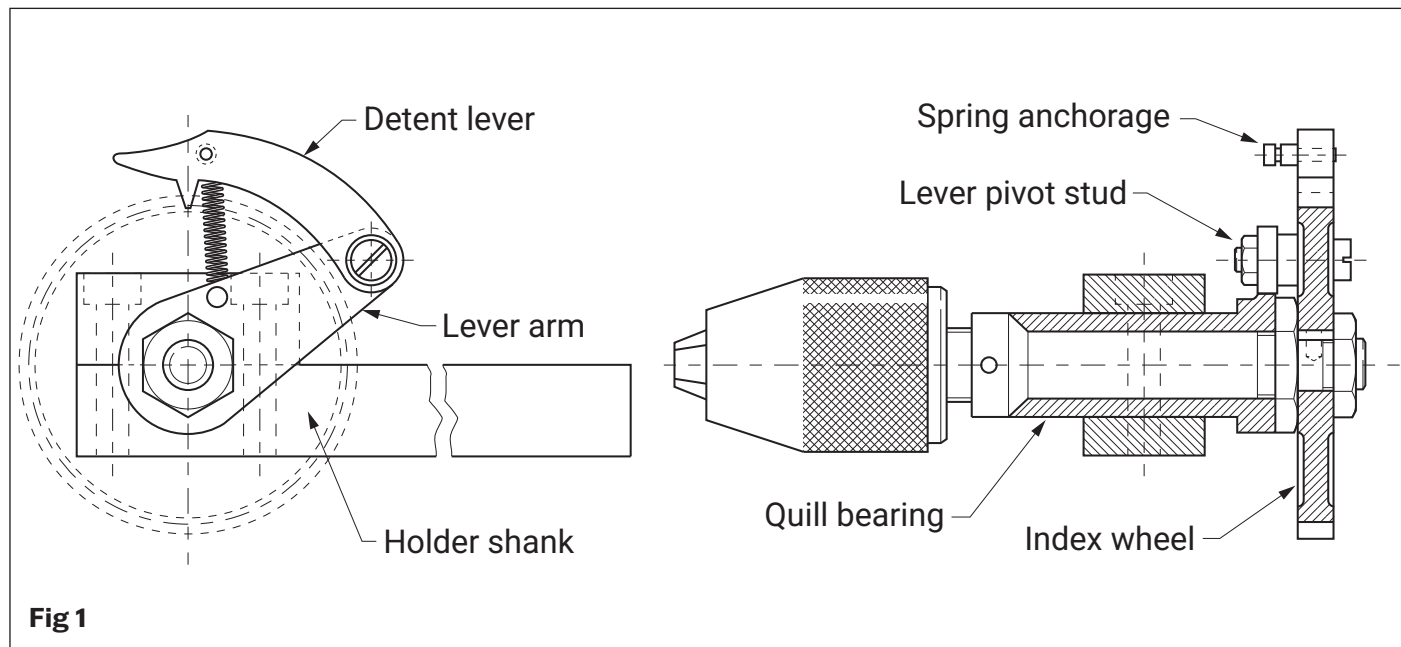
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A Tool Post Indexing Device by “Ned”

One of the finest and most prolific contributors to Model Engineer was **Edgar T. Westbury**. He wrote under several pen-names, using ‘Ned’ for articles on tooling. This practical and straightforward dividing fixture appeared in Model Engineer in 1949.



This modest but extremely useful item of lathe equipment was evolved from very simple beginnings, arising out of the practical need for some means of holding small round stock at centre height for light slotting or milling operations. The most common application for such operations is in slotting small screw-heads, and while it is quite easy to carry this out without machine-tool aid, by the use of a hand saw, it is not so easy to do this really neatly, and most screws which have been slotted by hand tend to look somewhat untidy on close inspection. Very often the slots are out of centre, ragged in finish, and not uncommonly a false start or slipping of the saw results in marring the face of the head. In cases where screws have to be made in quantity, specialised appliances or machine fixtures, more or less elaborate in design, are generally used; but for slotting an occasional screw, it is essential that the fixture should be simple and capable of being fitted up and dismantled very rapidly, otherwise the time absorbed is not

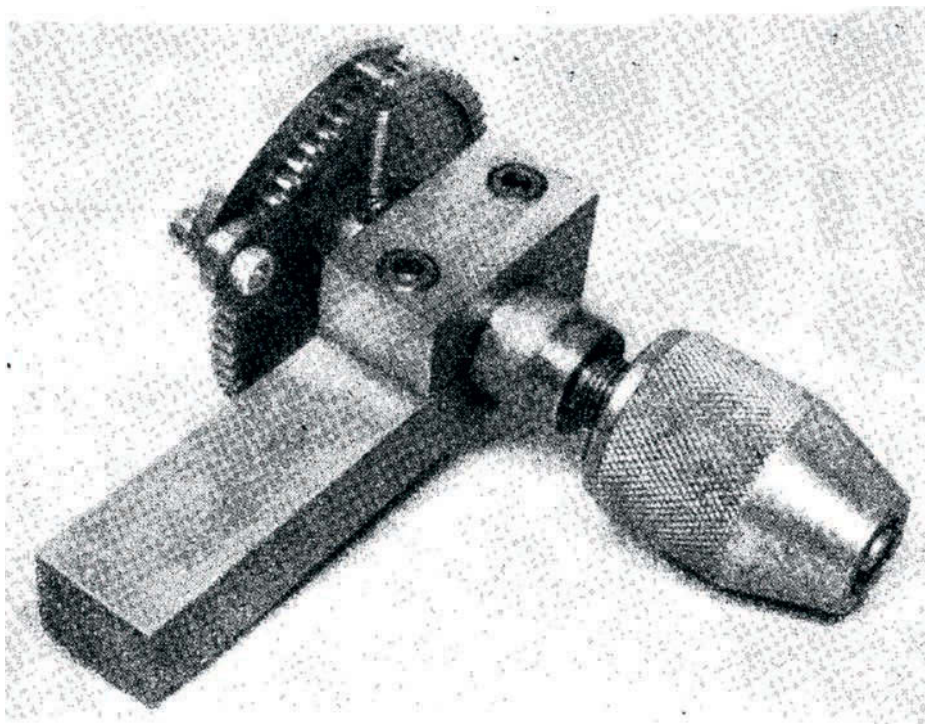
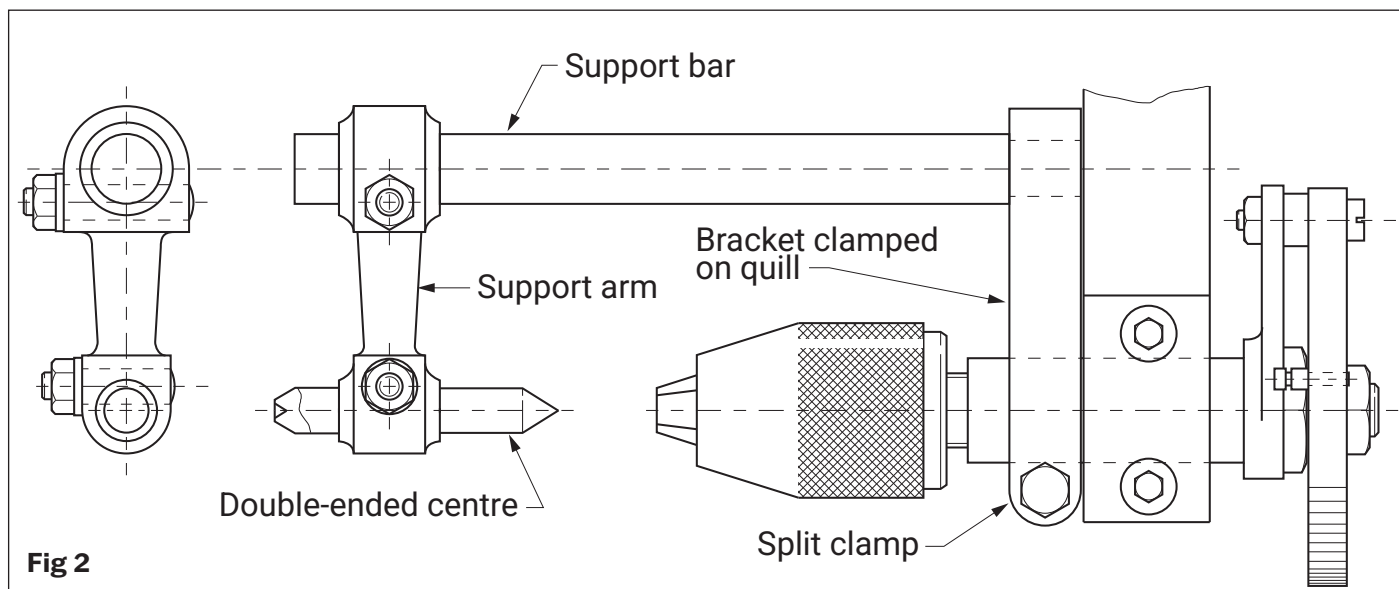


Photo 1: The Indexing device with clamp holder arranged for tool-post mounting.



justified. The method first used by the writer for this purpose was to hold the screw in a cheap drill-chuck with a parallel shank which could be held in a split tool-holder, or on a vee packing-block, in the lathe tool-post. This fulfilled the main requirements fairly well, and as the slotting operation did not entail any severe cutting stress, it was found that the screw could be held sufficiently firmly by this simple chuck, without marring the threads perceptibly. In this respect, it may be noted that a more expensive form of chuck, though capable of holding the work more firmly, would tend to bruise the threads unless they were protected by screwed bushings or soft linings; all of which would tend to make the fixture more complicated in use. This very primitive holding fixture—if indeed it could claim to be called a fixture—was not, however, without its practical disadvantages. In the first place, the height of the centre-line of the chuck had to be adjusted by packing, as it is clearly desirable that this should coincide with that of the lathe centres, so that the concave slot formed in the screw-head should be of equal depth at the edges; and this adjustment wasted valuable time when a rush job was in hand. The over-hang of the chuck from the front of the tool-post, when held in this way, was rather excessive, and if the screw being dealt with was fairly long, it was not supported as rigidly as might be desired. It was in some cases found desirable to have some means of rotating the work after fixing it in the chuck, but this entailed loosening the holder and probably disturbing the location of the chuck.

The obvious possibility of being able to carry out simple indexing of work held in this way made it desirable

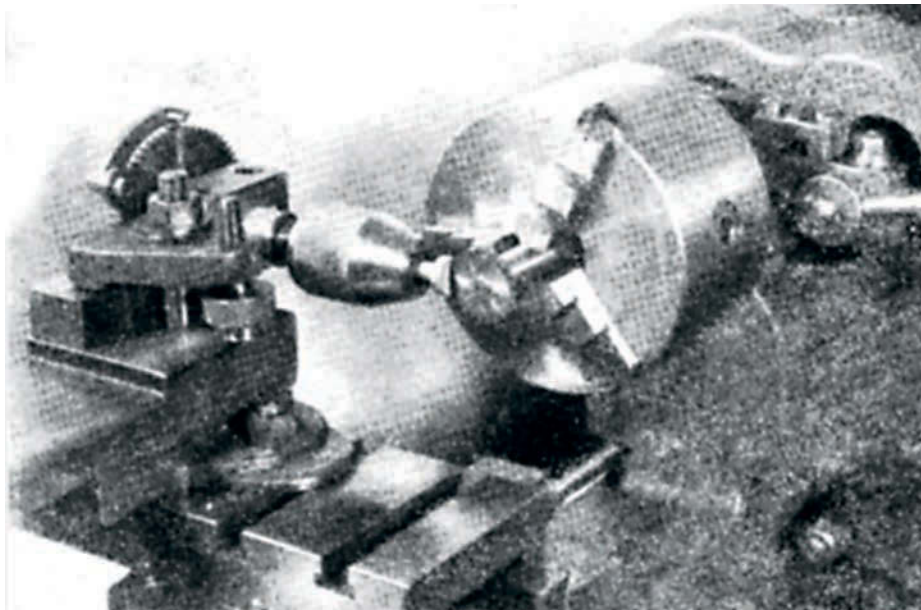


Photo 2: The fixture in use, slotting a large screw head.

to improve the method of mounting so that the chuck spindle could be rotated without disturbing the holder. In the final form of the fixture, shown in the illustrations, the chuck spindle is held in a bush or 'quill' which in turn is clamped in a split 'plummer block' type of holder, the lower component of which is extended to form a square shank for convenient mounting in the tool-post. At the tail end of the spindle, an indexing plate of some kind is attached; in the particular case illustrated, this consists of a spur gear-wheel having an appropriate number of teeth for the range of divisions required. This serves its practical purpose quite well and is usually the easiest thing to obtain, but a specially-made drilled and notched division plate with an appropriate form of detent or index pin may be fitted if preferred. A 60-toothed wheel gives

a convenient range of divisions. The shank of the holder is made of rectangular mild-steel bar of suitable section to mount in the tool-post, and in some cases it may be found necessary to reduce either the height or the width at the shank end, though the parallel section shown fits either the Myford M.L.4 or M.L.7 lathes, and enables the division line to be made exactly on the level of the lathe centres without the need for packing or other adjustment. A short piece cut off the same bar is used to form the top half of the clamp, and is secured in place by two sunk-head $\frac{1}{4}$ in. Allen screws, after which the seating is bored from the lathe chuck, with the assembled holder mounted in the tool-post. In this way, the correct height of the chuck spindle is positively assured. The object of fitting the spindle in a quill bearing is to enhance the versatility of the fixture,

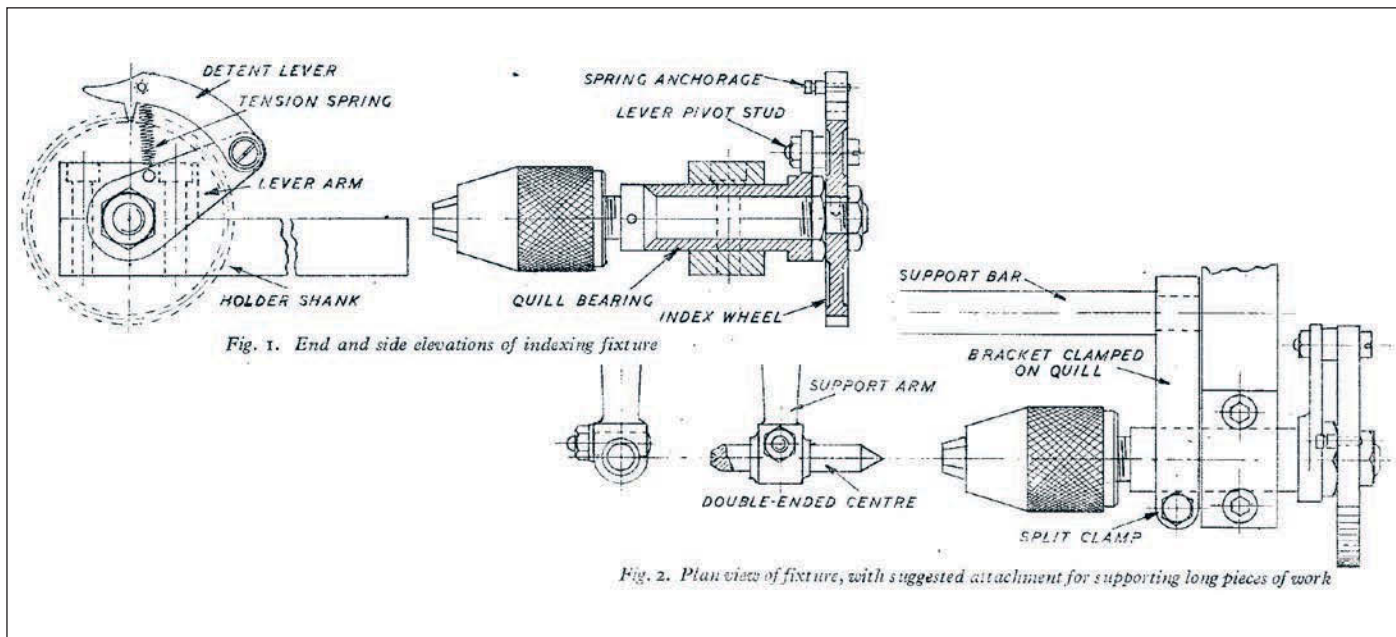
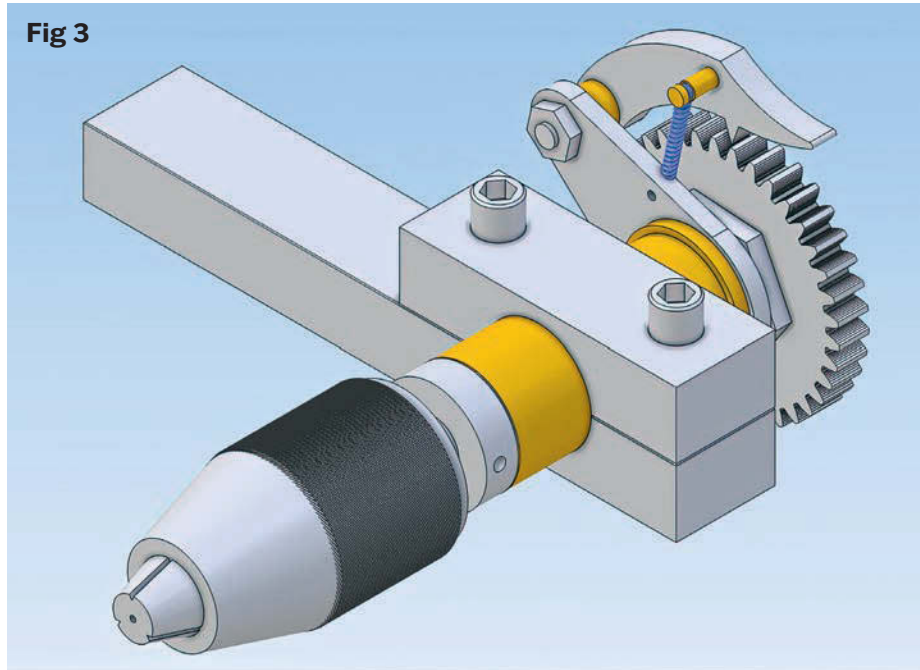


Photo 3: The hand drawn figures from the original article.

as it enables the complete spindle and indexing gear to be slipped out of its holder and used in some other form of mounting – on the vertical slide, for instance – while the split clamp may be used to carry other fittings, such as a round-shank boring-bar or a light drilling or grinding spindle. In the method of indexing employed, it is convenient to attach the arm which carries the detent lever to the rear end of the quill; any method of attachment is suitable so long as it provides the requisite rigidity. The detent lever is made from mild steel, with the indexing tooth either cut from the solid or brazed on; it should be shaped to fit neatly into the teeth of the index wheel without bottoming, and the eye end of the lever should be wide enough to provide a substantial bearing on its pivot stud, the fit of which should be good. In the event of a drilled division plate being used, this pivot may be substituted by a shouldered stud carrying a fairly heavy spring blade with the index-pin attached to the end. With the pivoted lever, either a torsion spring on the pivot stud, or a tension spring between the lever and the arm, may be used to keep the detent in engagement; In either case it should be fairly strong to prevent all risk of inadvertent movement. To withstand end thrust on the chuck spindle a collar is pressed on and firmly pinned, then finally machined in position with the spindle running between centres. By coning the back face of the collar, endwise adjustment of the spindle also takes up any side play which may exist in the quill bearing. A thin nut is used at the back of the spindle to take up end play, and this is locked by the division plate

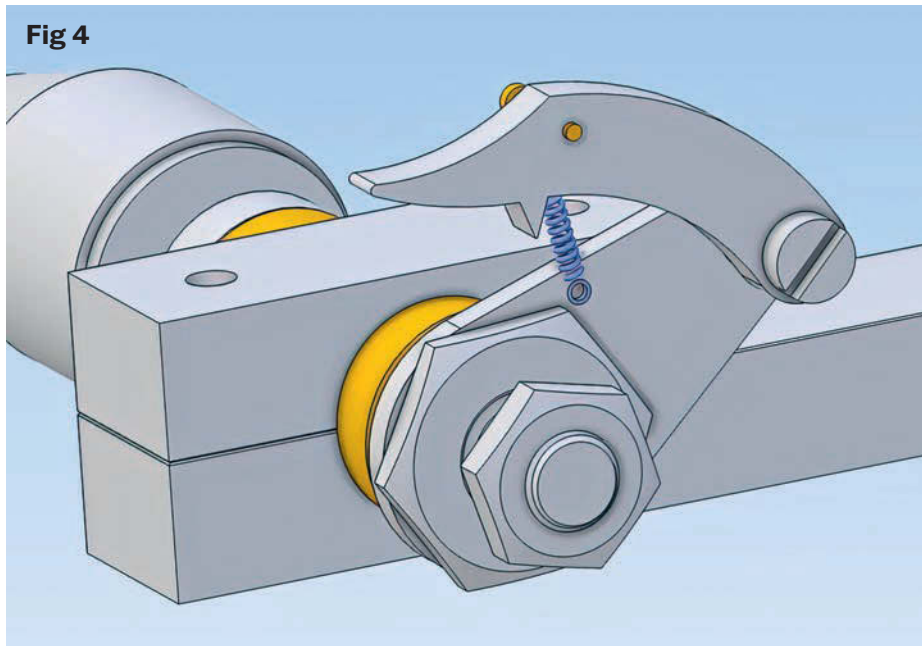


when the latter is keyed on and further secured by the nut at the outer end.

In addition to the original purpose of the fixture for screw slotting, it can now be just as simply applied to forming the heads of small hexagon bolts, or squaring the ends of taps or reamers with the aid of an end-mill or facing cutter. Time may be saved in milling hexagons or squares by using two cutters – thick slotting saws will do – spaced out by a collar on the arbor, the same thickness as the required size across flats, so as to work simultaneously on both sides of the head, and finish the job in three indexing operations for hexagons, or two for squares. This method, incidentally, relieves the chuck spindle of all torque strains.

It will be apparent that one can quite easily machine 'blind' hexagons – in other words, those with a solid round collar or 'washer' formed below the head – in this way. The fact that the shoulders of the hexagon are left slightly concave' depending on the radius of the cutter used, is hardly perceptible if the spindle is at the correct height so as to produce a symmetrical cut. An important point when straddle milling with two cutters is that the work should be properly centred between them, and the best way to ensure this is, when turning the head, to leave a 'pilot' on the end of the same diameter as the finished size across flats; this is easily located to pass between the two cutters

Fig 4



with equal clearance, and ensures a properly balanced cut. The pilot-piece can easily be turned away after forming the head, and when a number of similar bolts have to be formed, it is only necessary to provide one of them with a pilot for initial setting. For screw slotting, a small 'pip' may be left in the centre of the head to assist in locating the cutter – as a matter of fact, the 'pip' is usually there whether it is wanted or not, in screws machined and parted off in the usual way.

The fixture can be brought into action very quickly, as it is only necessary to substitute it for the turning tool in the lathe tool-post, and put the cutter arbor in the chuck – no more than a few seconds' work. Actual machining is in most cases equally expeditious; it will, of course, be appreciated that the main utility of the device is for dealing with light, 'fiddly' jobs, such as bolts from about 1/8 inch or 4-B.A. downwards, or slotted screws from 1/4 inch downwards. Such work is often extremely difficult to handle in other ways, even when a fairly extensive equipment is available.

POSSIBLE IMPROVEMENTS

It is quite obvious that this simple device is capable of considerable improvement in many ways, but anything in the nature of complication is best avoided if it involves a risk of impairing its ease of application. A better form of chuck would be a logical improvement, especially as the milling of polygons imposes more strain on the work than the slotting of screws. If screwed bushings are used to hold the screws, they should be of thin section,

and slotted so as to be compressible when the chuck is tightened up. Cut the slots obliquely or spirally to avoid the risk of the slot coming in line with a chuck jaw and forcing the work out of truth. For dealing with work of greater length than can normally be accommodated in the depth of the chuck jaws, it may be desirable to provide a hollow spindle. The thrust-pad of the simple screwed chuck generally has a solid centre, but is capable of being drilled out to allow the work to pass through it. When projection of the work well beyond the chuck jaws is inevitable,

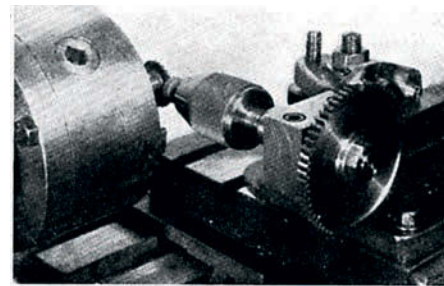


Photo 4: Another view of the fixture in use.

some form of steady or back centre support is indicated; it was intended to fit something of this nature to the device illustrated, but so far, the necessity for it has never yet arisen. A suitable form of support very easily fitted to or removed from the appliance, is illustrated in **fig. 2**. When it is desired to use the device for fluting small taps or reamers, the centre height position is not suitable, unless specially formed end-mills, which are not very efficient for this purpose, are employed. The best way to get over this difficulty is to mount the entire assembly on the vertical slide, which thus provides facility for height adjustment. With the end support in use, it is not beyond the capability of the device to use it for cutting small gears and pinions. If a greater range of indexing is called for, a worm dividing gear may be added, but here, perhaps there is a danger of straying far beyond the bounds of the simple function for which the device was intended.

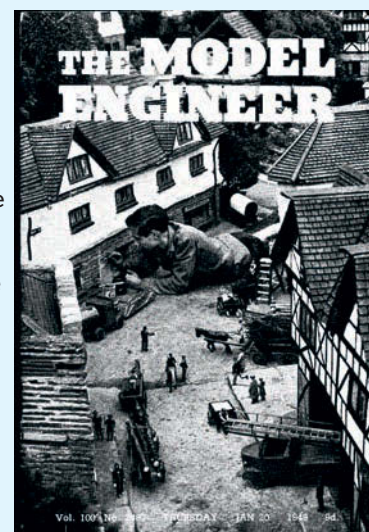
About this Issue

This article was originally published in *Model Engineer* Vol. 100, issue 2487, January 20 1949. The cover picture was described as follows:

THE POPULAR model village of Bekonscot provides the scene from which this week's cover picture is taken. During the winter months, the little village undergoes a certain amount of renovation and re-painting to make it ready for summer visitors. The re-painting process provides some novel situations for the painters, one of whom is seen at work while some of the Lilliputian inhabitants look on, with evident interest.

Bekonscot Model Village in Beaconsfield remains the oldest original model village in the world. Its place on the cover of this 1949 issue is a reminder of how wide ranging the scope of the magazine, and our hobby, was in years gone by.

The issue included the expected live steam topics: LBSC on Locomotive Building Overseas and the introduction of J. I. Austen Walton's *Twin Sisters*, a pair of L.M.S. dock shunters with contrasting levels of detail. Other subjects were Refrigeration in Miniature, The Early History of Machine Tools, Fashion in Funnels, The 'Miniauto' Motor Bicycle (made by a reader with a claimed 350mpg), and Power Tools from ex-R.A.F. Motors. ●



The completed tram engine.



A 5" gauge Steam Tram

Graeme Monk concludes the story of an unusual and interesting model, starting with a look at the unusual reverser arrangements.

Once again, this runs along the length of the boiler, right next to the regulator, **photo 8**, I was about to start fabricating the wheels at either end when I suddenly had an idea. Glancing at my LNWR 2-4-2 5ft 6 Tank class the reversing wheel is the perfect size, and number of spokes for the tram. I contacted Christopher Rayward who has a fine collection of casting for LNWR locomotives. He very graciously sold me two wheels even though it was for a GER loco, **photo 9**.

So here's where I found a grey area, there's no drawings for the reversing gear as such. Clearly it has to be driven by a set of bevel gears, so I winged it. I made 4½ inch bevel gears to fit on the 3/16 rod. Then dropped vertically down to a screw reverser. Again, a left hand ¼ BSW thread seemed to do the job nicely here.

On all the photographs and drawings I can find of both the G15 and the C53 all the bevel gears are encased in a cover that makes it impossible to see how this worked. Since there are none left in preservation, due to a clerical error when two were earmarked for preservation, I had to give this my best guess and place them in a position where it wouldn't interfere with the right-hand check valve.



Photo 8: Routing the reverser rod.

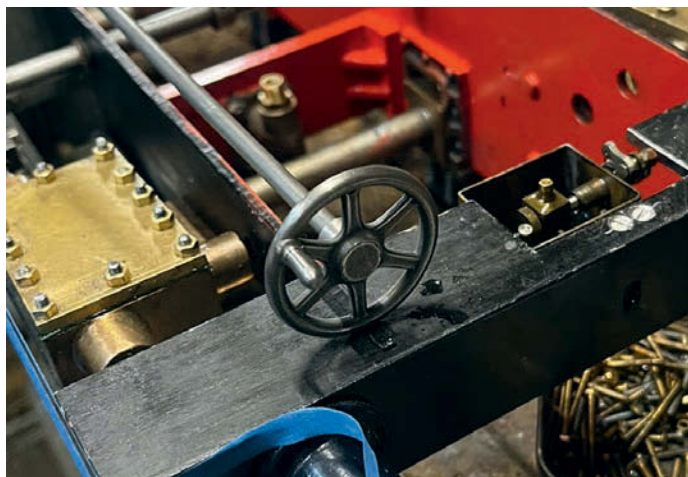


Photo 9: Repurposed LNWR wheel.



Photo 10: An improvised wood steamer.

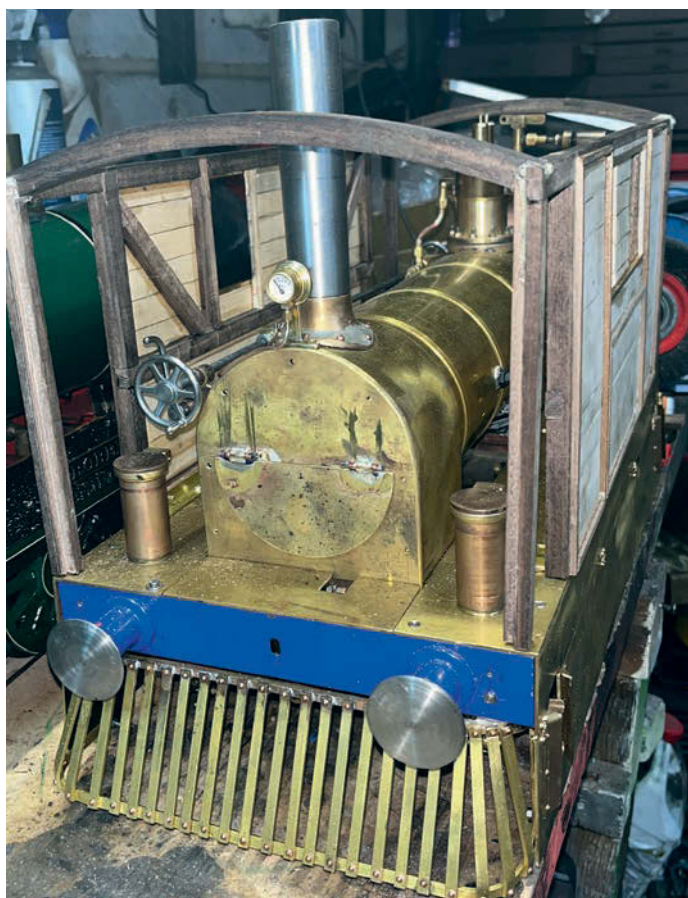


Photo 11: Progress with the bodywork.



Photo 12: Further progress.

BODYWORK

I took a long time to think about how I would tackle this. First thing to say is wood and I aren't natural allies. Much happier working with metals, I just don't have the 'feel' for wood work. So do I not take the risk and make a metal body, or do I take the risk of copying the full size and pray to all the deities that nothing warps, shrinks, or even catches fire.

Reading accounts from the full size they were a maintenance nightmare, having to go to both the loco shed and then the carriage workshop. I believe

they would have been originally made of teak, but I couldn't get this confirmed. So in the end I decided to make the frame out of 3/8 mahogany and the planking out of oak, hoping that these woods would be less likely to move.

The colour wouldn't be right, but I can fix that with stains or paint. I used a series of mortise and tenon joints and half lap joints. Bending the roof joists actually went easier than I expected. I used an old metal scaffold pole and connected it to the end of my Kelly Kettle to make a rudimentary steamer, **photo 10**. I covered the pipe in old rags for insulation. For every square inch

of wood it should be steamed for 30 minutes, I left mine in for an hour to make sure it was really pliable.

I made a former to give me the correct radius and along with every clamp I have. I removed the wood from the steamer, and it was like rubber, making it easy to bend around the former where I left it to dry for 24hrs.

I experimented with different glues and settled on a cyanoacrylate adhesive along with brass tacks. My thought process here was that I want a chemical and mechanical way of holding all the body together, **photos 11 and 12**.

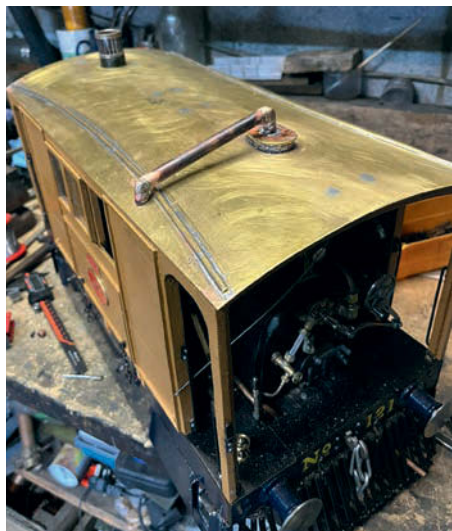


Photo 13: The brass roof before applying Dacron.

The roof was made from a sheet of brass, after I rolled it, I soldered on the rain deflectors and used Dacron fabric for aircraft to cover the top, **photo 13**. This is perfect, as like coaches of old having a canvas fabric roof, the trams had exactly the same. Dacron seems to deal well with the heat and being self-adhesive, it's easy to iron on while pulling out the wrinkles.

Even though the boiler is lagged using ceramic flue lining and brass I was still a little concerned about heat transfer to the body work possibly charring it. I did consider lagging the inside of the bodywork but decided against it, as there is a 1½ inch gap from the body work to the boiler.

Now what to stain it? I experimented with different varnishes, oils and stains. But settled on paint for two reasons. First colour, as I'm basing the loco on the original livery, I needed a very light brown/caramel colour, **photo 14**. The second was protection from water and heat. I used a high heat paint designed for brake callipers on cars, and even though it's not the easiest paint to put on it does give a nice finish that's very durable.

I made small brass 1/8" U channel to make the slides for the windows, the windows being made of a brass frame and then cladded with strips of mahogany, **photo 15**. Each window was glazed using glass designed for candle lanterns and I never want to cut glass again! Even with the sharpest glass cutter and using lubricants it was a pain in the proverbial to cut without it chipping.

BELLS AND WHISTLES.

I wanted the bell to sound and look right and like most things in life you can't have it all without some form of



Photo 14: The light brown/caramel colour.

compromise, so I decided to have a dummy bell on the top and a larger bell mounted underneath the roof to give a better sound. The largest bell I could fit in was a 3-inch fire bell I purchased for the grand sum of £5. However this was electric, so I had to make a striker. I would have had to do this anyway as it has to be designed to be used from both ends.

I used thin flexible wire to operate the bell and the whistle, as chain would have the possibility of snagging. The bell wire has an additional connection that links up to the dummy bell so at least it moves when the bell is pulled.



Photo 15: The bodywork after glazing.

A similar arrangement was made with the whistle, making a small dummy bell whistle that has a 1/16 pipe feeding it from the actual whistle, again hidden under the roof.

Even though this model was a challenging build it's proven to be fun to drive and easy to steam, **photo 16**. It's an ideal loco to teach new drivers, as long as you don't mind getting a parting in the back of your head and you're firing going backwards.

I have to thank my local club members and particularly our boiler testers who gave me great advice while I was building the boiler, and my father who has more patience than my local hospital, when he was trying to teach a 14-year-old how to use a lathe without becoming part of it. 🍷



Photo 16: The completed tram under steam.

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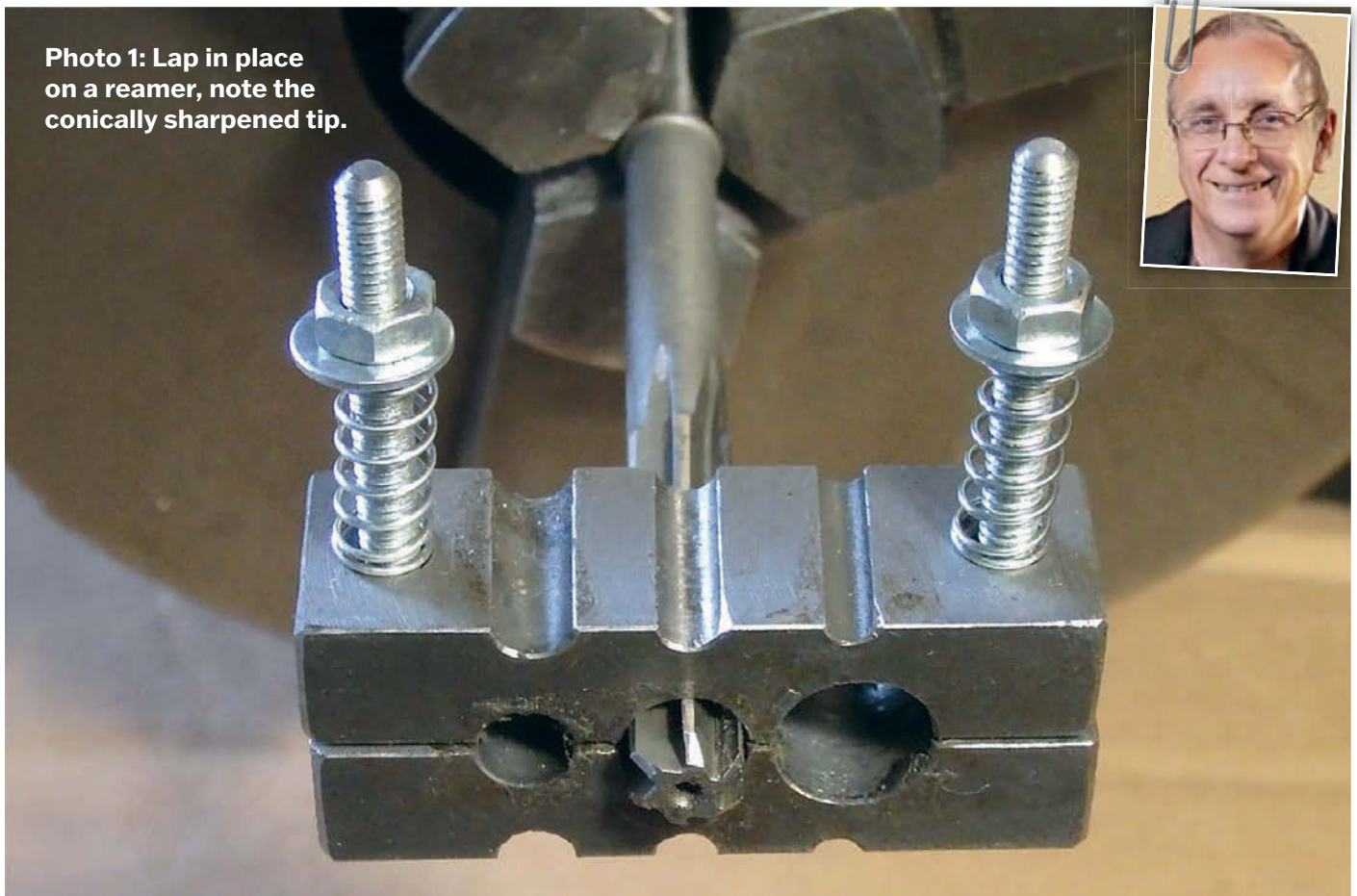
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Photo 1: Lap in place on a reamer, note the conically sharpened tip.



Lapping Reamers To Size

Jacques Maurel experimented with some poor quality reamers that were cutting oversize.

I own many poor machine reamers, the reamed hole being worse than one obtained from a plain drill, and of a bigger diameter; hence, I had the idea of lapping the reamers to get a good diameter from them, see **photo 1**.

the actual hole diameter D from the DTI measurement:
 $D = (R \times (15/20)) + d - 0.01$
 (D = actual diameter; d = nominal pin diameter; R = DTI measurement.)

All the reamers were bad (0.05 to 0.1mm oversize for the hole) relative to the quality H7 written on them. See **table 1** for diameters from 0 to 18mm for H7 and H8 tolerances. For

TESTING REAMERS FOR SIZE

A piece of mild steel plate (between 10 and 15mm thick) was drilled (0.2mm under the reamed hole diameter) and reamed with a good lubrication, then the obtained diameter was measured on the exit side of the test piece to avoid any bellmouthing of the hole. This was easy for diameters of 5mm or more using an inside micrometer, but for the smaller diameters (3 and 4mm) I used the following method.
 A pin made from silver steel was set in the hole and the rocking movement measured with a DTI, **photo 2**. The pin diameter being 0.01mm undersize and the DTI stem 5 mm above the part (15mm thick), a quick calculation (Thale's theorem) will give

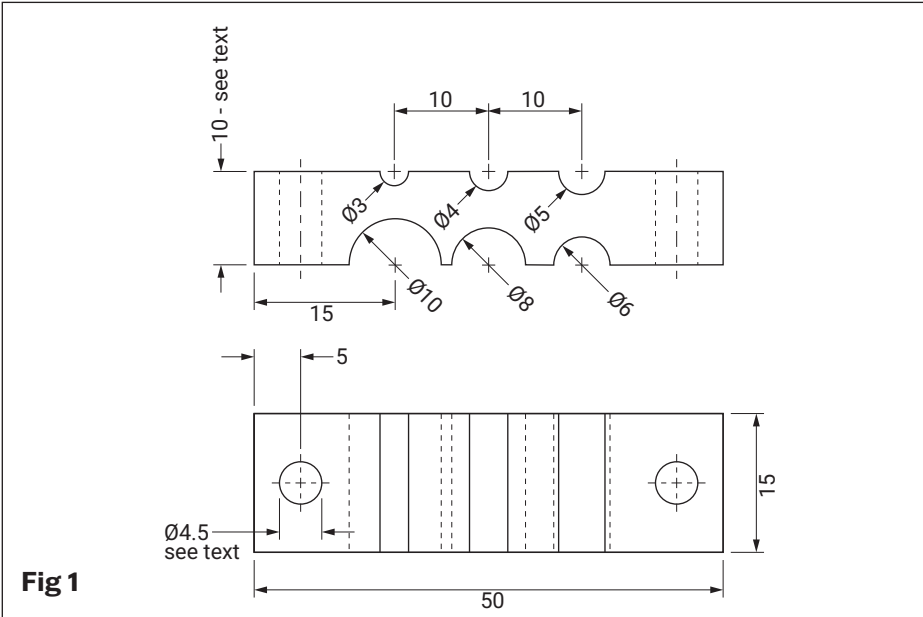


Fig 1



Photo 2: Testing the fit of a pin in a reamed hole.

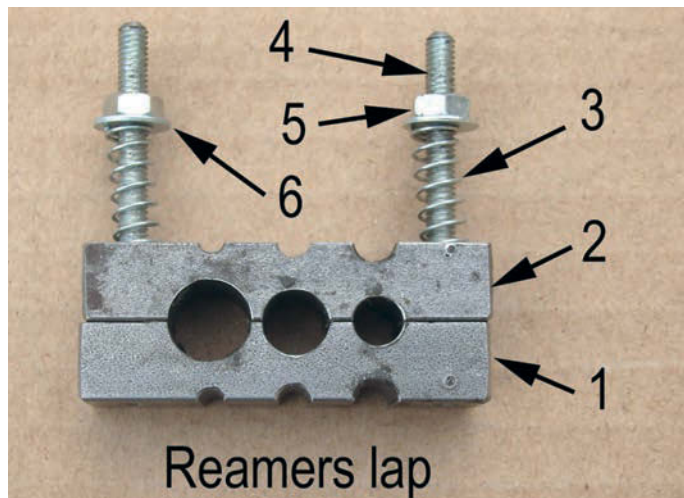


Photo 3: The lap.

comparison, a typical sheet of paper is 0.1mm thick and aluminium kitchen foil is 0.016mm thick. The diameter measured across opposite teeth was good (checked with a micrometer). So perhaps was it a sharpening problem?

Table 1: Tolerances for H7 and H8 bores in mm.

	0 to 3 (included)	3 to 6	6 to 10	10 to 18
H7	0/+0.01	0/+0.012	0/+0.015	0/+0.018
H8	0/+0.014	0/+0.018	0/+0.022	0/+0.027

BASIC SHARPENING

My first job was to give a conical chamfer to the reamers, holding them in an ER 25 collet with a small protrusion. Why? Because the reamers teeth are usually not equally spaced to avoid chatter and get a better cylindricity, in fact two opposite teeth are on the same diameter for sizing but the next teeth pair is slightly off from an even dividing value for example for a six-tooth reamer, two adjacent teeth pairs are separated by an angle different from 60°. This means tooth indexing must be made from a stop under the tooth and not from a dividing plate, this is difficult for small diameter reamers. The conical chamfer solves this problem, of course there is no clearance, and you'll have to apply an axial force for the reamer to cut but the depth of cut is only 0.1mm (for diameters up to 10mm) so the axial force is not too high.

Alas, a test after sharpening gave nearly the same result as before sharpening!

LAPPING TO SIZE

A mild steel lap was made, **photo 3**. Some information was obtained from

the book *Lapping and Polishing* by E.K. Hammond (Tee Publishing) pages 39 and 40. It said that mild steel is satisfactory for lap making, while cast iron would be better, and that there is no value in using abrasive coarser than 150 grit (mesh).

A 3mm reamer was set in the lathe chuck, the reamer smeared with 240 grit valve lapping compound, the lathe run (in reverse) at 250 RPM, and the lap moved by hand along the reamer's teeth. The lap was pinched between thumb and fore finger and run forwards and backwards times over about 10 seconds. The reamer was then thoroughly cleaned (to remove the lapping compound) before testing by drilling and reaming a test piece.

Surprisingly the test gave an almost ideal result, the hole being only 0.02mm oversize while it was 0.08 before lapping?

I can't understand, nor explain this result as the reamer's diameter was almost unchanged. Perhaps a reader can give the explanation?

A little more work was done to get a better result. It's a time-consuming process (three or more tests for one reamer), but not too long for the diameters for which you own the matching drill (0.2mm under the finished hole diameter).

As for some dimensions I have four reamers, one was lapped until getting an easy press fit with a matching silver steel pin.

MAKING THE LAP

See photo 3 and **fig. 1**. The shells 1 and 2 are made from 10x15 cold rolled steel 50mm long, the shells are held together in the milling machine vice for drilling the lapping holes. Drill the assembled lap for the stud

holes, diameter 3.2mm, these holes are then tapped to M4 for shell 1 and enlarged to 4.5mm diameter for shell 2.

Mill down one contact plane of each shell to allow for tightening of the lap on the reamers. Remove 0.5mm on the 3, 4, 5mm side of shell 1 and 0.5mm on the 6, 8, 10mm side for shell 2.

Table 2: Parts list

Part	Quantity	Name	Material	Remark
1	1	Lower shell	FCMS	See text
2	1	Higher shell	FCMS	See text
3	2	Closing spring		See text
4	2	Studs M4	4-6	42mm long
5	2	Nut M4	6	
6	2	Washer 4mm diameter		

Spring 3 has outside diameter 6mm, wire diameter 0.5mm, six turns, free length 19mm compressed to 16mm. The lap closing force is 5N, this is very low but exerted on the reamer's lands that are quite narrow, so the pressure is high.

REAMING WITH A PLAIN TWIST DRILL

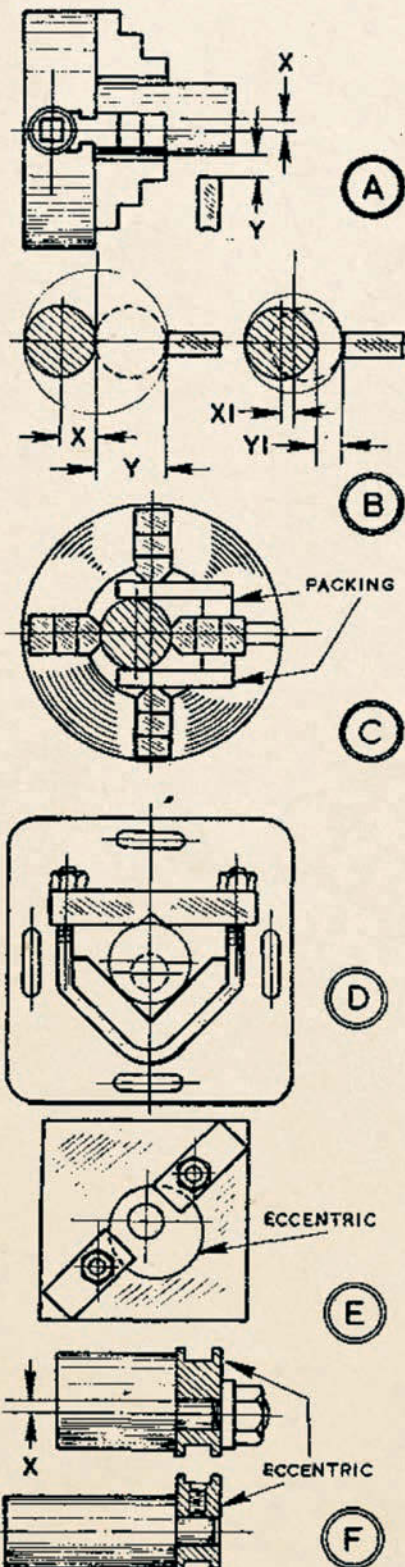
This is sometimes done after rounding well sharpened drill edges with a slipstone. The hole is reamed after having been drilled 0.2mm undersize. The hole size is not too bad (H9 or H8 quality if you are lucky) but the hole is rarely straight due to the drill having only two cutting lips, so this is good only for short holes (less than 2 diameters long). ●

These articles by Geometer (Ian Bradley) were written about seventy years ago. While they contain much good advice, they also contain references to things that may be out of date or describe practices or materials that we would not use today either because much better ways are available or for safety reasons. These articles are offered for their historic interest and because they may inspire more modern approaches as well as reminding us how our hobby was practiced in the past.

Beginner's Workshop

By GEOMETER

ECCENTRIC MOTIONS AND SET-UPS



MOTIONS employing eccentrics are common in applied mechanics and can be arranged in several ways.

First, in conjunction with a connecting rod, an eccentric gives straight-line motion to a spindle or plunger. Second, without any intermediary, an eccentric gives straight-line motion to a spring-loaded tappet in a guide. Third, using a pivoted lever, an eccentric gives circular motion to its free end through a small arc and such a lever may be spring-loaded like the tappet for return, or this may be arranged by employing a connecting rod between the eccentric and the free end of the lever.

The first application is normal for operation of the slide valve of a steam engine, or the plunger of a feed pump; while the other two applications are normal for operating the petrol pumps of car engines.

Basically, eccentric motion is the same as that of a crank-connecting-rod system, with the difference, however, that for most practical purposes the mechanism is non-reversible.

This is to say that, while a crankshaft can be turned to operate a piston, or a piston pushed to turn a crankshaft, only an eccentric can be turned to operate a spindle or plunger. Neither can be pushed to turn the eccentric, owing to the friction involved in the disproportion of the considerable diameter to the small throw.

Setting up bar

Since an eccentric is circular, a loose one to fix on a shaft with a grub screw can be machined in a straightforward manner in a lathe. A four-jaw independent chuck is employed to set up the round steel bar for the outside to be turned to size and the bearing surface machined. Then the whole bar is displaced eccentrically in the chuck for drilling and reaming the bore or drilling and finishing with a boring tool.

The off-set of the bore (or throw) in relation to the outside diameter is normally

obtained in one of two ways. With the bar held in the chuck, as at A, the off-set required is X, and is obtained by regulating the chuck jaws. Rotating chuck and bar, and bringing, a flat-ended tool or pointer just to touch the high spot, then rotating a half-turn to find the low spot, a gap, Y, is left, and this is twice X.

Thus, Y can be measured with a small rule or a piece of material of suitable thickness or diameter can be used as a gauge (a drill shank, for example).

This is true whatever the size or offset, as at B. If the shaded bar is displaced so its side is on the chuck axis, the displacement is equal to the radius X, and when the chuck is rotated the gap is equal to the diameter Y. At a smaller off-set of the bar, X1 is half Y1.

The second way of obtaining the off-set or throw is to mark the bar while laid in V-blocks, centre-punch the position, then bring this spinning true in the chuck.

If the off-set is kept in line with a pair of chuck jaws, the position of these on the chuck face serves as a guide in preliminary setting-the face may be ringed for reference, or a small rule may be used to check movement of the jaws.

For a considerable off-set, packing is advisable between two jaws and the bar, as at C, to avoid side thrust on the jaws and admit of proper adjustment. Strips of paper between the packing and surfaces, in conjunction with firm tightening, will avoid slip. Packing may also be used when fouling of jaws would otherwise occur.

A bar may be set up in a V-angle plate, D, for machining or boring eccentrically, the angle plate being mounted on the lathe faceplate and adjusted accordingly. Again, a single eccentric can be bored clamped to a flatplate, this held in a four-jaw chuck.

An eccentric mandrel, F (top), can be used for machining outsides after boring when several eccentrics are being made; and for facing ends, eccentrics can be pressed or held by a grub screw on a simple mandrel (bottom).

Fourrunner Mk2 Oscillating Engine PART 1

Peter Stuart shares his updated design based on David Fulton's design, described by his son Stuart Fulton in ME&W issues 4776 and 4777.

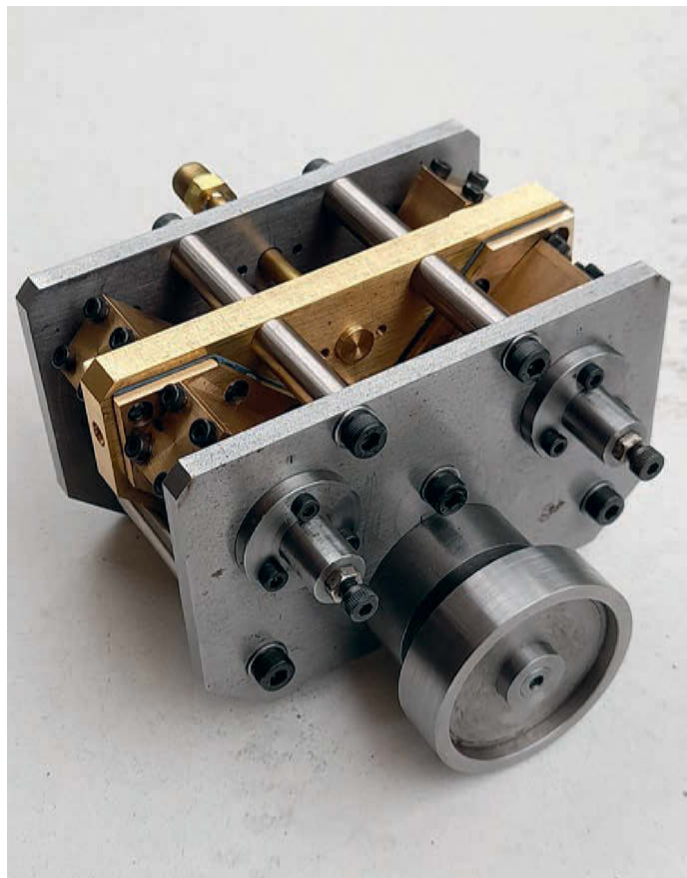


Photo 1: Main view.

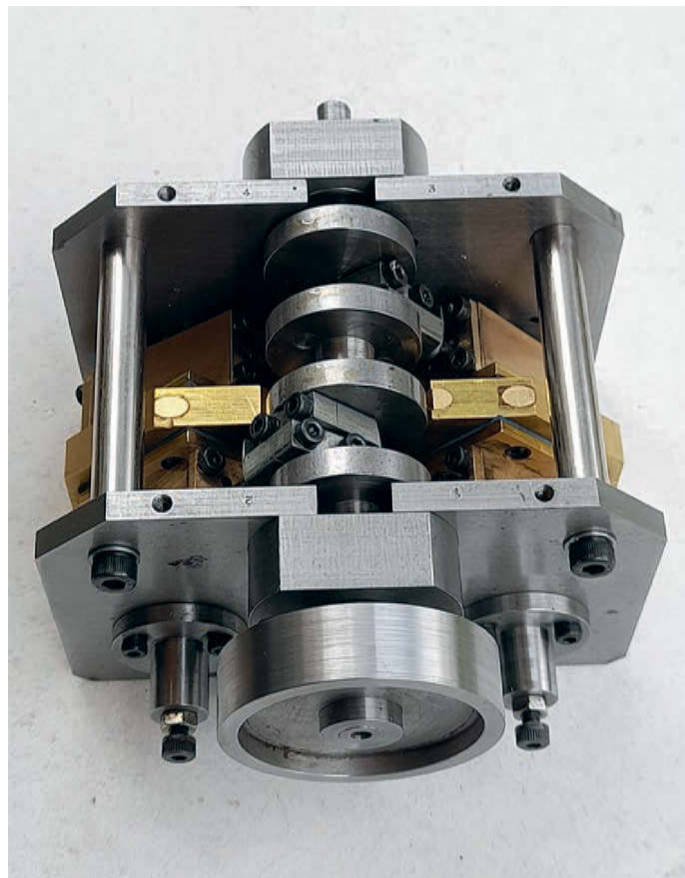


Photo 2: Underside view.

In ME 4713 March 2023, there was an article about the importance of port shape and orientation in oscillating engines by David Fulton. At the end of the article there was a tantalising picture of a V4 engine designed and built by David which he had named 'Fourrunner'.

The picture aroused my interest and after approaching the then editor, I learned that unfortunately David had passed away. However, I was able to communicate with David's son who was willing to share his father's sketches and notes about the engine.

I am greatly indebted to the late David Fulton for the design and development of his V4 engine and to his son Steven for assisting me.

After obtaining the necessary information, I incorporated some minor changes to suit my own design

preferences, availability of local materials, and metric dimensions. Screws are rationalised to just a few sizes.

The result is Fourrunner Mk2, a successful engine which performs well, **photos 1 and 2**. Each cylinder has a bore of 12mm and stroke of 18mm, yielding a total swept volume of 8.14cc. The cranks are 180° rotationally apart. The engine is not reversible; the direction of rotation is clockwise when looking at the flywheel. Total weight is 2.7kgs.

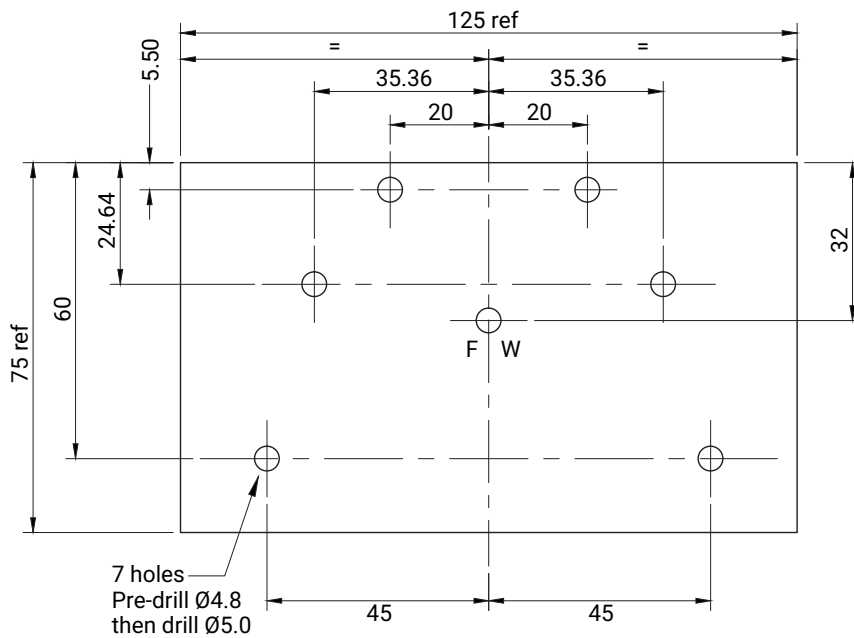
When powered by compressed air, the engine will self-start at 140kPa (20psi) and tick over down to 70kPa (10psi). At 280kPa (40psi) it will easily achieve 2,000rpm. There is little vibration from the engine when running because 90-degree V4 reciprocating engines have inherent primary balance. There is however, a mild rocking couple along the length of the engine caused

by the orbiting mass of the two pairs of big ends being a short distance apart.

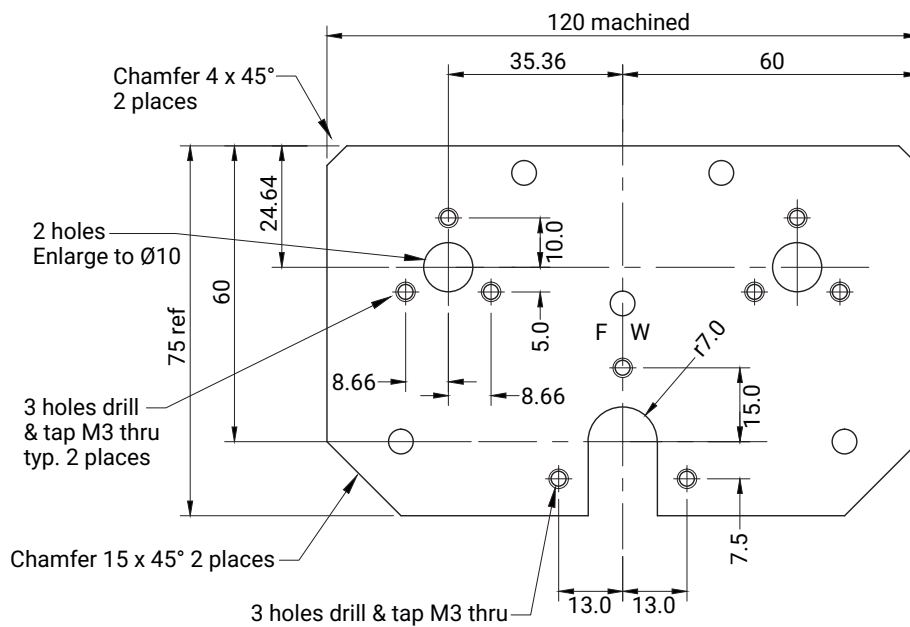
The engine has only one pipe connected to it and that is for the air/steam inlet. Exhaust ports are located around the edges of the central brass manifold.

BUILDING THE MODEL

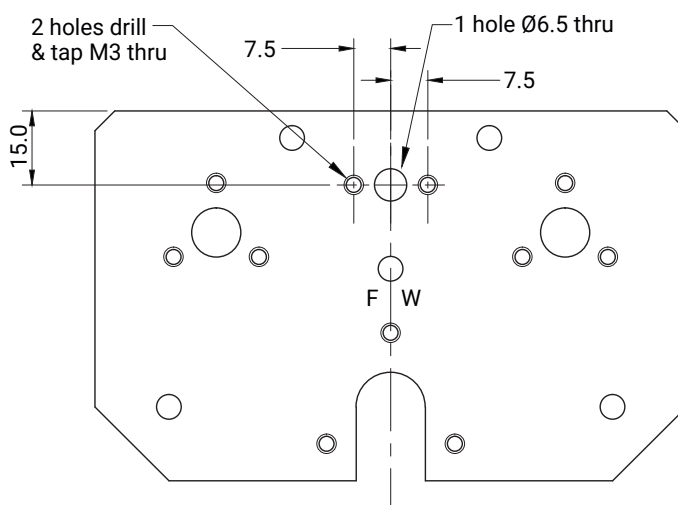
Accurate workmanship is essential for smooth running of the engine when completed. It is assumed that intending constructors have DROs fitted to the three axes of their mill and possibly their lathe, if it is an imperial model. Your mill should be 'trammed' to ensure the vertical slide and quill are truly perpendicular to the table. Ball-end Allen keys are recommended for assembly, in the following sizes: 2.5mm, 3mm and 4mm.



Step 1:
Front and rear endplates (BMS)
and manifold plate (BMS)
to be clamped and
drilled together.
The manifold plate to be
underneath.

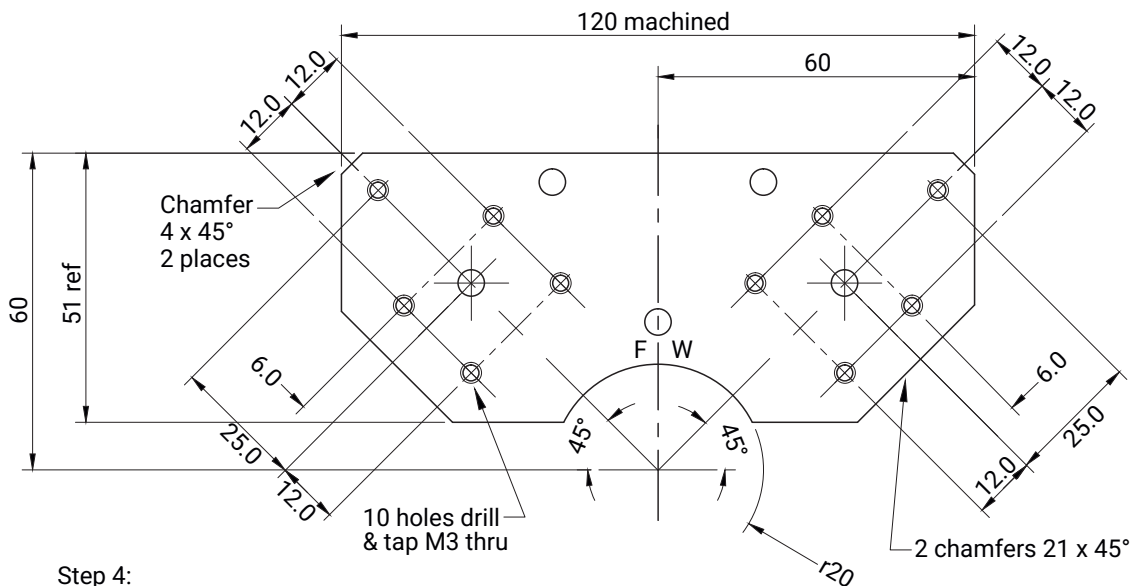


Step 2:
Front and rear endplates
(2 plates 75 x 6 BMS) to be bolted
together for milling edges
and drilling holes.

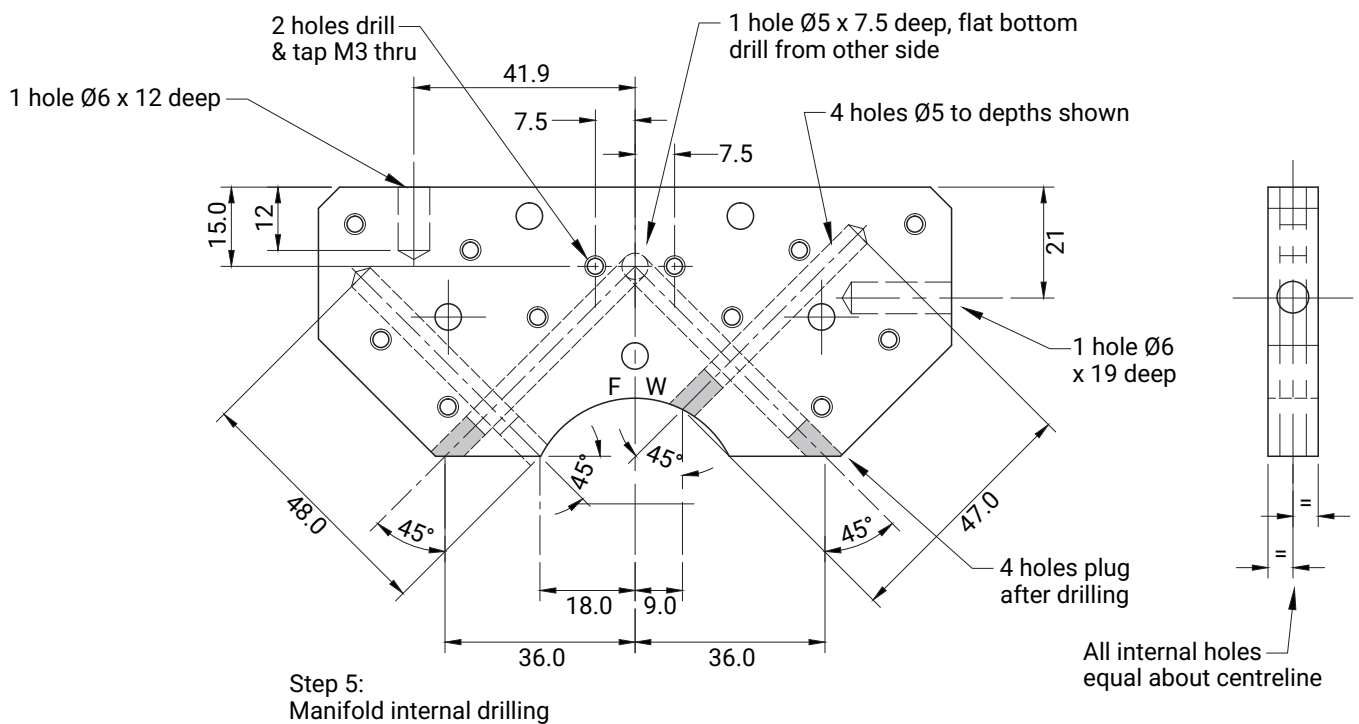


Step 3:
Rear endplate additional drilling

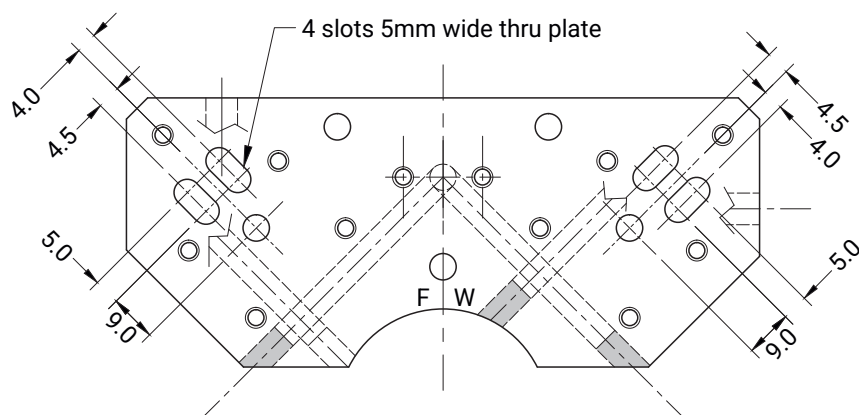
Fig 1



Step 4:
Manifold 51 x 9.5mm brass plate
Additional drilling and edge milling



Step 5:
Manifold internal drilling



Step 6:
Manifold slotted holes

Fig 2



Photo 3: Squaring the plates for clamping.



Photo 6: Milling the manifold circular cut-out. Faceplate mounted on rotary table.

Use of free-machining steels (FMS) is encouraged. 1214 grade in particular, machines very nicely in small lathes using HSS tooling (Editor's note: ANSI 1214 is an Australian designation; the UK equivalent is EN1A Pb or 230M07; I recall Harold Hall insisted on using the later designation stockholders often still use the former!) It also seems to resist light surface rusting. I have also used ground steel rod which can be salvaged from discarded home printers. It comes in small diameters and machines easily.

If you intend to run the engine on steam, you should make the pistons and piston rods from stainless steel 304 grade to prevent corrosion.

It is advisable to number stamp all parts 1, 2, 3 or 4 in relation to which cylinder they belong and where each cylinder sits in the frame. It makes re-assembly much less confusing. I numbered the cylinders in the

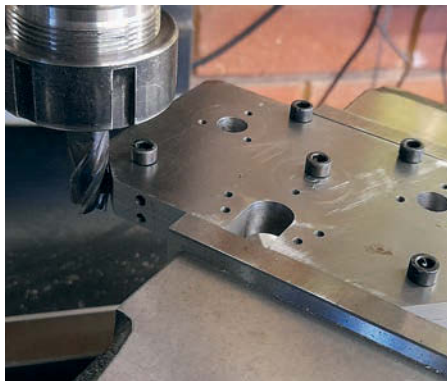


Photo 4: Steel endplates bolted together for milling and further drilling.



Photo 7: Milling the edges of the manifold.

order of their power strokes through one revolution. Looking at the flywheel end, the left cylinder is No.1 and the right cylinder is No.2. The rear cylinder on the left is No.3 and the rear right cylinder is No.4.

The drawings should be sufficiently detailed for information. However, additional notes follow for those who may not have experience of this type of engine.

FRAME

This consists of two steel endplates with a brass manifold spaced between, **fig. 1**. I was not able to obtain 75 x 6 bright steel bar here in Sydney, so I purchased 75 x 10mm bar and faced it to 6mm thick while holding it in a 4-jaw chuck.

After being roughly cut to slightly oversize length, the three plates should be stamped on one side with 3mm high letters "FW", or similar. This



Photo 5: Tapping holes in the rear endplate using a DIY tapping guide.

identifies the faces which will be seen from the flywheel end of the engine while it is being assembled.

The top edge of each plate must be levelled with the others, by standing them vertically on a flat machined surface, with a 90° square at the side, **photo 3**. Make sure all the 'FW' stampings are upside down and all facing the same direction. Temporarily clamp the three plates together. The two steel plates can be tack welded at the corners.

The clamped plates can now be set up on the mill for match drilling the seven 5.0mm holes as shown on the drawing (**fig. 1**, step 1).

Remove the brass manifold plate and insert M5 screws with nuts through five holes in the steel plates and tighten. Grind off the tack welds on the corners.

Now mill the slot, the ends and the mitred corners. Also drill the other holes which are common to these two plates (**fig. 1**, Step 2) and **photo 4**. Lastly, separate the plates and drill the holes which are needed in the rear plate only (**fig. 1**, Step 3) and **photo 5**.

MANIFOLD

This is the heart of the engine because it contains internally all the supply and exhaust passages for the four cylinders, **fig. 2**. Provision has also been made in the drillings for a possible upgrade to double acting cylinders.

Start by milling the brass manifold's 20mm radius cutout, **photo 6**, and mitred corners, **photo 7**, then drilling and tapping 10 holes (**fig. 2**, step 4).



Photo 8: Drilling internal passages in the manifold.

The manifold should then be clamped vertically to an angle plate at a 45° angle for drilling the internal passages, **photo 8**. Great care must be taken in the drilling of the long, inclined passages, (fig. 2, step 5). Since they start on a sloping surface, a 5mm endmill followed by a 5mm slot drill should be used until sufficient depth of hole (at least 5mm) will guide a 5.0mm twist drill. The depth of drilling must be closely monitored. After drilling, the

four open bottom ends of these holes must be plugged with short, tight-fitting brass rods.

Finally, the manifold must be set up in the mill vice again for cutting the supply and exhaust slots (fig. 2, step 6). Constructors might wonder why this could not have been performed before. The reason is the danger of the 5mm drill running off course and possibly breaking when it enters the off-centre slots, had they been present, **photo 9**.



Photo 9: Milling slots in the manifold.

The six short spacers between the plates can now be made, **fig. 3**. These must be of exactly equal length, and a length stop should be rigged up on your lathe to ensure this. The length of the two long spacers can be determined by taking an accurate measurement when the frame is first assembled.

Next time we continue with the port plates

To be continued.

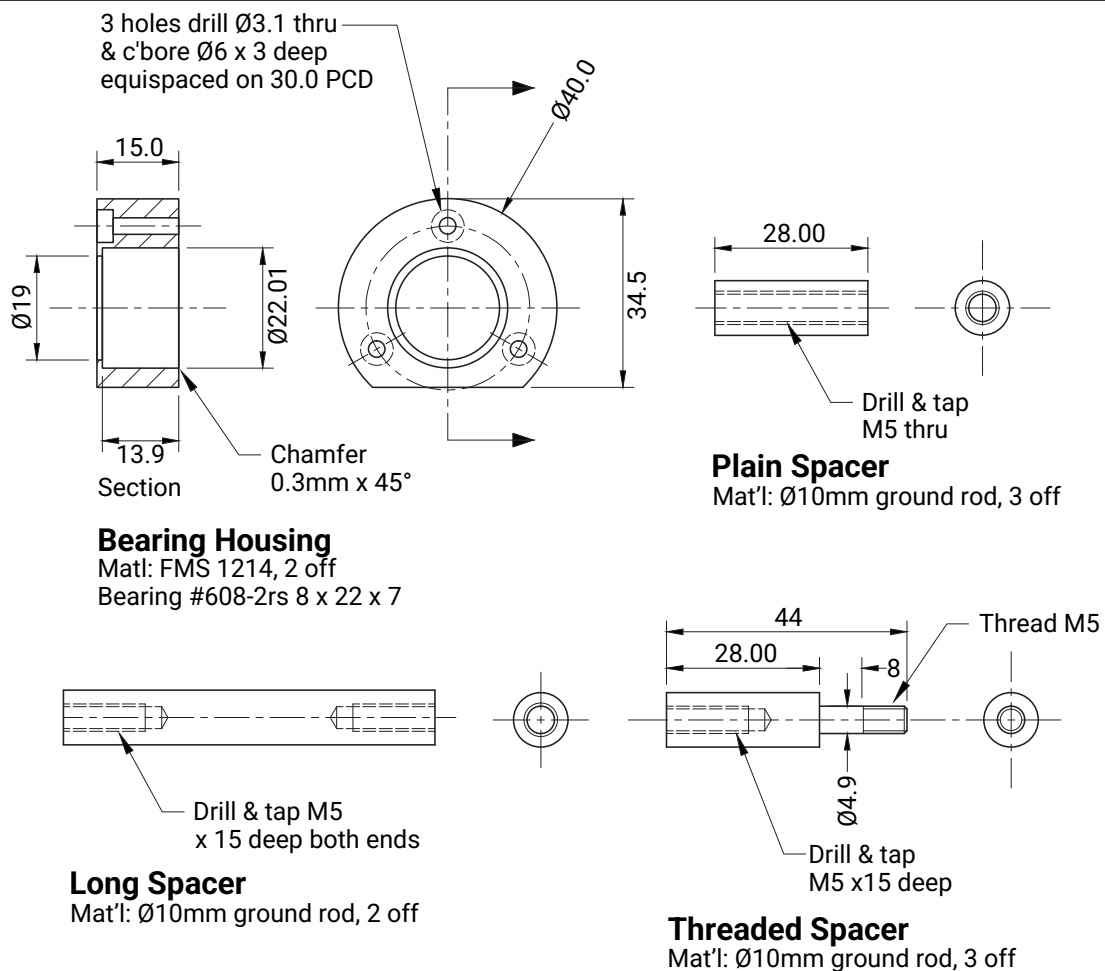


Fig 3

Using Oxidation Colours For Tempering Steel

Tempering, the controlled reduction of hardness after quench hardening of carbon steels, makes it less brittle, increasing its toughness and aiming for a compromise state appropriate to the required application. In the US tempering is often informally used to refer to hardening, and they use drawing to refer to the process known as tempering in the UK.

When steels are heated in the presence of oxygen, a thin oxide film of a thickness related to the temperature forms on the surface. Interference effects give a colour to this film that indicates the maximum temperature reached, over a broad range which usefully corresponds to that required for tempering hardened steel for various purposes. For example, springs can be tempered by heating until they show a dark blue colour, whilst many cutting tools only need to be heated

until they take on a dark straw colour.

A clean surface is needed to get a clear view of the colour of the oxide film. **Figure 1** gives an indication of the colours and temperatures for different purposes. Obviously, the accuracy of the colours is limited by the printing process, there is no substitute for gently heating a piece of steel and watching the colours develop for yourself.

Another alternative, if you have one, is to use a non-contact infra-red thermometer, figure these are relatively inexpensive devices that can measure up to 380° C. Their typical accuracy is much greater than estimating from colour, but they do require a reasonable target area to give an accurate reading – one way to achieve this is to place smaller parts on a piece of steel plate and heat them together.

Bear in mind that the colours only appear when the steel is in ordinary air, so move the flame away to check them.

A popular approach is to heat the shank of a tool so that the colours ‘run’ towards the cutting edge. This leaves the shank softer, but tougher, which can give a more durable tool. For very small parts make a small tray of sand in a metal lid and heat it from below.

Quenching is advised to stop small parts from overheating, but there is no harm in allowing them to air cool.

Another approach is to use an oven for hardening. This could be a temperature-controlled furnace, but a domestic oven is suitable for most parts. 220 C, 425°F (gas mark seven) for twenty minutes works well for general purpose tools, giving a dark straw temper. You may need to experiment to find what temperature setting works best for your oven. This is a good approach for larger parts as it allows them to temper evenly right to the core. Dry and lightly oil tempered parts as soon as they are cool enough to handle. ●

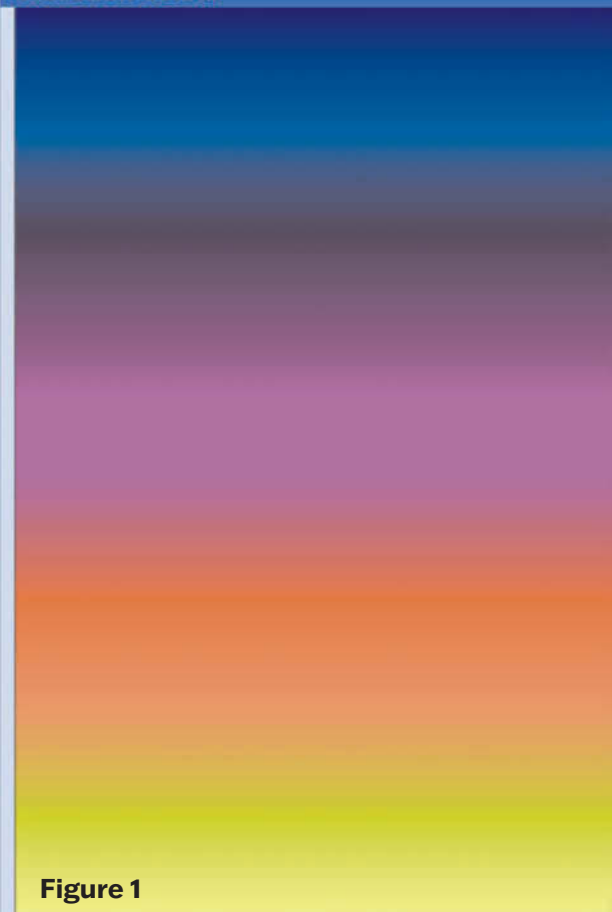
Oxidation Colour	Description and Temperature	Example Uses
	Light blue – 335 C (640 °F)	Parts where flexibility is needed, such as springs or ratchets.
	Dark blue – 310 C (590 °F)	Tools requiring toughness but not cutting ability, such as screwdrivers or tommy bars.
	Purple – 282 C (540 °F)	Punches, riveting tools.
	Brown – 260 C (500 °F)	Drill bits and striking tools, form tools and single point gear cutters.
	Dark-straw – 225 C (440 °F)	Most general-purpose cutting tools, scribes.
	Light-straw – 205 C (400 °F)	Reamers and precision cutters.
	Pale-yellow – 175 C (350 °F)	Scrapers and very hard tools for delicate jobs.

Figure 1

MODEL MAKING METALS

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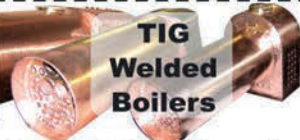


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**MAIDSTONE
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Latest News from the Midlands Model Engineering Exhibition

Meridienne Exhibitions look forward to welcoming you to the UK's largest model engineering exhibition, the Midlands Model Engineering Exhibition, taking place from Thursday 15th to Sunday 18th October 2026 at the Warwickshire Event Centre.

The exhibition will feature nearly forty leading specialist trade suppliers, offering everything model engineers need—from tools, machinery and materials to components and expert advice.

At the heart of the show are the models themselves. Visitors can enjoy hundreds of exhibits across thirty-two competition and display classes, showcasing exceptional craftsmanship and a wide range of engineering disciplines.

Why not put your model in the spotlight and enter the competition and display classes and be part of the show? Entry forms can be found on the website. More than thirty clubs and societies will also be in attendance, presenting their own displays and providing opportunities to connect with fellow enthusiasts.

The Edinburgh Society of Model Engineers will be exhibiting for the first time this year. Founded in 1894 ESME is the oldest model engineering club in the world! The showpiece of their display will be a 7 1/4" gauge tender locomotive of an Eastern European prototype. This has been a labour of love since 2003 and will be newly completed ready for October.

The Fosse Way Steamers, will also be returning again for some live action!



**THURSDAY 15th to SUNDAY 18th
OCTOBER 2026**

WARWICKSHIRE EVENT CENTRE

www.midlandsmodelengineering.co.uk

Returning again is Davinder with his stunning traction engine 'Anjali'. As the only Sikh in Europe to own, exhibit and operate model traction engines, Davinder is passionate about preserving engineering heritage and inspiring younger generations to get involved in the hobby – come along and meet him and the other steamers.

A programme of live demonstrations, workshops and talks will be announced in the coming months, offering further opportunities to learn and develop new skills.

This unique exhibition is the result of a tremendous amount of effort by many hundreds of modellers and other enthusiasts.

A full list of confirmed exhibitors to date is available at www.midlandsmodelengineering.co.uk and you can purchase advance tickets.

Visitor Information:

- Opening Hours: Thursday to Saturday: 10:00 AM – 4:30 PM; Sunday: 10:00 AM – 4:00 PM.
- Ticket Prices: Adults: £14.00; Seniors (65+): £13.00; Children (5-14 years): £5.00; Under 5s: Free. Tickets are valid for any one day and can be purchased in advance via the exhibition's official website. www.midlandsmodelengineering.co.uk
- Venue Address: Warwickshire Event Centre, A425 Southam Road, Leamington Spa, CV31 1FE.
- Facilities: The venue offers free parking, restaurant and coffee shop facilities, and a shuttle bus service from Leamington Spa Railway Station on Thursday 15th October (charges apply).

For the latest updates and detailed information, please visit the official exhibition website: www.midlandsmodelengineering.co.uk.

The Bradford Cup and Stevenson Trophy 2026

This is the final call for entries for the two model engineering competitions that are decided by a poll of readers of Model Engineer & Workshop and members of our forum, www.model-engineer.co.uk

The Stevenson Trophy

Funded by many donations from

readers in memory of John Stevenson, the Stevenson Trophy is presented for a well-made and usable piece of tooling, a modification to a machine or an accessory for a tool where the fact it works well is more important than making it look good.

The competition is open to all *Model Engineer & Workshop* readers and

Model Engineer forum members, who may enter their own work. We encourage entries of items published in MEW, but unpublished items can be entered. To enter, send no more than four good photographs of your entry with up to 500 words of description by email to neil.wyatt@kelsey.co.uk no later than **26 July 2026**.

The Bradford Cup

The Bradford Cup is awarded to the author of the best article or series in *Model Engineer & Workshop* during the previous year. Articles that appeared in Issue 4762, March 2025 to 4773, February 2026, are eligible for this year's competition.

The cup was donated by Bradford MES to the Society for Model and Experimental Engineers, SMEE, and latterly has been presented at the Midlands Model Engineering Exhibition. Entry to the Bradford Cup is by nomination by a third party only, you

cannot nominate yourself. To make a nomination, please send the name of the author and the article in question to neil.wyatt@kelsey.co.uk by **26 July 2026**.

Full rules for both competitions appeared in ME&W Issue 4778.

Necroprinting

3D necroprinting is probably one of the most unlikely engineering techniques we have come across. It is described as a 'biohybrid manufacturing technique' that repurposes the harvested proboscides (feeding tubes) of dead female mosquitoes as ultra-fine 3D printing nozzles. Developed by researchers at McGill University, this sustainable method achieves microscopic print resolutions down to 20 µm—finer than a single white blood cell.

Developed as an offshoot of the field of 'necrobotics'—which uses the non-living body parts of insects for engineering—3D necroprinting offers an ingenious and highly cost-effective solution to micro-manufacturing. Traditional glass or metal dispensing nozzles in similar sizes cost between \$80 and upwards of \$800 each, while organic mosquito nozzles cost just cents.

The proboscis is carefully removed from an euthanized female mosquito under a microscope. It is then aligned with the outlet of a traditional, slightly larger syringe-based plastic dispense tip and fused together using a UV-curable resin. The tough, naturally engineered biological structure is strong enough to withstand internal extrusion pressures of about 60 kPa, allowing it to easily push highly viscous liquids.

This sustainable, high-definition method has potential across a variety of scientific fields. In tissue engineering it can be used for printing microscopic, complex biological scaffolds that encapsulate living cells, for example in regenerative medicine and cancer research. It could also be used for building intricate 3D micro-scale



Photo: Simon Kutcher, AFAP. Department of Foreign Affairs and Trade. CCA2.

geometries for highly precise drug-screening applications. It has potential for use in micro-electronics by delivering tiny droplets of conductive inks or assembling minuscule semiconductor chips.

You can find a detailed paper about of how researchers have been able to convert these natural mouthparts into precision fabrication tools at Science.org. using the link tinyurl.com/3mmpfhxr or the QR code.

Closures of TG Jones (WH Smith) Stores

You may have seen recent news reports regarding the planned closure of a number of TG Jones stores (formerly WH Smith). At present, it remains unclear whether your nearest store will be affected. To ensure you continue receiving future issues without interruption, we encourage you to consider one of the following alternative options should your local store close.

- Subscribe – see inside this issue for great offers. It guarantees best price and reliable delivery.
- Go on-line to our shop, where you can buy a copy and have it delivered to your door. shop.kelsey.co.uk
- Use the on-line store finder to see other stockists in your area. www.frontline-group.co.uk/store-finder
- Order a copy at your local newsagent for collection by yourself or request home delivery.



Readers' Tips



We have £30 in gift vouchers courtesy of engineering suppliers Chester Machine Tools for each month's 'Top Tip'. Email your workshop tips to neil.wyatt@kelsey.co.uk marking them 'Readers Tips', and you could be a winner. Try to keep your tip to no more than 400 words and a picture or drawing. Don't forget to include your address! Every month we'll choose a winner for the *Tip of the Month* will win **£30 in gift vouchers from Chester Machine Tools**. Visit www.chestershobbystore.com to plan how to spend yours!

STORING PIERCING SAW BLADES

Our tip winner this month is Norman Billingham, with a tip for storing these thin delicate blades.

It can be difficult to keep track of piercing saw blades in the workshop as there are so many different sizes. It's even harder if you also have fretsaw blades for woodwork. A neat solution is to use plastic test tubes with stoppers. They are readily available quite cheaply from lots of eBay suppliers. Perhaps surprisingly they are usually listed as bar accessories rather than under lab supplies – it appears that they are often used in bars and clubs to serve shots of alcohol. They are available with push-in or screw tops and can be bought with tops of different colours. My wife has already grabbed at least one of mine to keep her crochet hooks tidy.



Please note that the first prize of Chester Vouchers is **only available to UK readers**. You can make multiple entries, but we reserve the right not to award repeat prizes to the same person in order to encourage new entrants. All prizes are at the discretion of the Editor.

City and Guilds 193 Mechanical Engineering.

Mick Knights presents a personal history of engineering training both ancient and modern.

It truly can be a surprise finding what lurks, long forgotten, at the bottom of some draws. I don't really recall exactly what I was looking for at the time but my attention was totally distracted when I came across some of my old City and Guilds exam papers from the sixties, a little yellow perhaps and some of the practical papers a little oil stained from workshop use, but treasure none the less, which sent the memory banks into overdrive and it's amazing what also lies forgotten in the further reaches of the brain!

Along with the majority of my peer group I count myself extremely lucky to have been a trainee at the time of the government's day release scheme, this, unlike many subsequent government training programmes actually worked and had a lasting benefit for most who attended them.

With this particular programme the government paid the employers for the employees' days absent from the workplace and so it was a win-win situation. As well as a whole day at college, there were also two evening sessions a week, which as the weather turned warmer didn't always sit well with many.

Along with practical work and accompanying theory there was mathematics, English and my personnel favourite, social studies. Social studies opened a window on the world and encouraged us to ask questions about current and past events which helped to start the inquiring mind set that has stayed with me ever since.

The mathematics were a little different from today's approach as this was a time before the pocket calculator. I never actually mastered the slide rule, or the guessing stick as it was affectionately known. All complex and angular calculations were carried out with the aid of four-figure log tables, these comprised of Logarithms and Anti-logarithms. I still have a set of four-figure tables in the bottom of my tool box, but today I don't have the faintest idea of how to use them!

The actual course I attended was *C&G 193 Mechanical Engineering*, which was widely regarded as one of

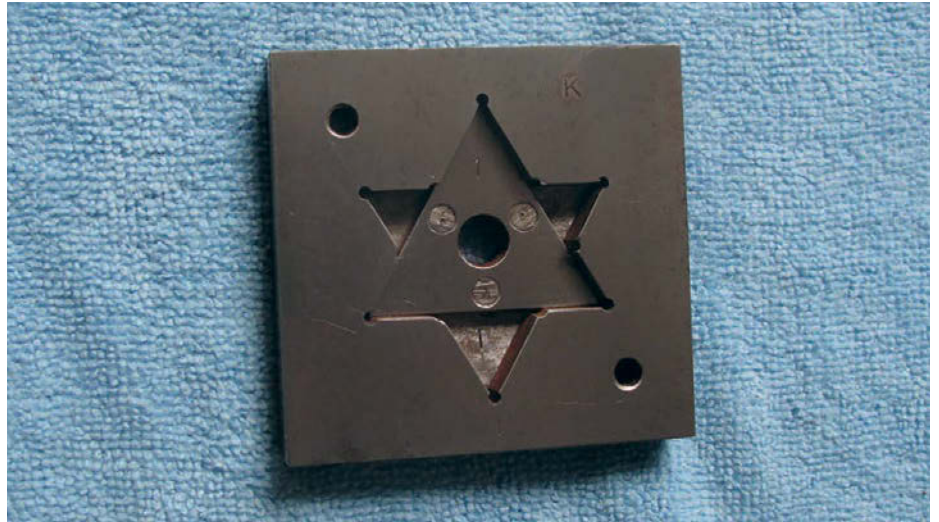


Photo 1: Complete second year fitting exercise.

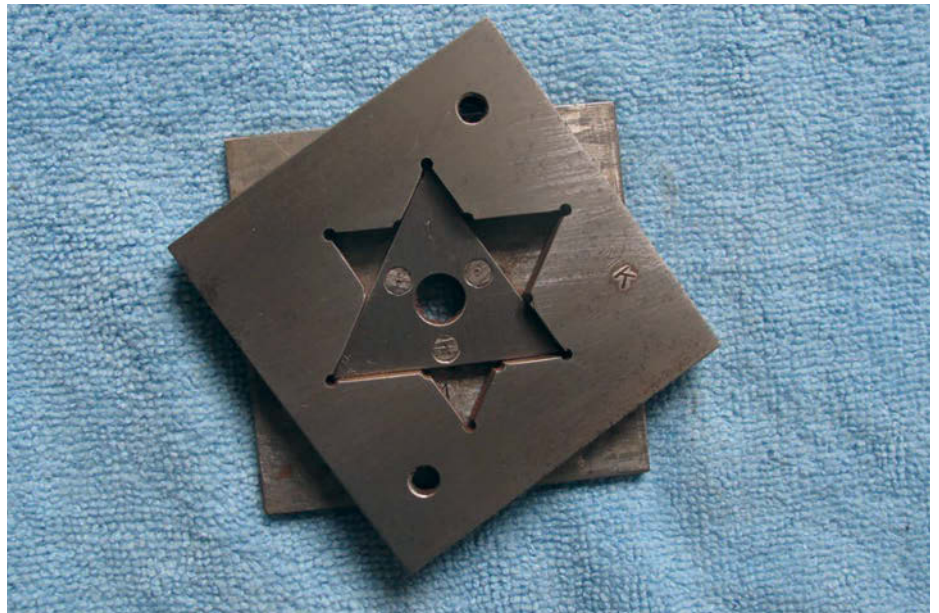


Photo 2: Star fits the triangle exactly in all directions.

the hardest and most demanding of all the trade courses. We were a pretty mixed bunch of trades ranging from precision and production engineers, to maintenance fitters. I recall there was only the one intake after mine.

Part one was a two-year course culminating in a twenty hour practical exam, ten hours machining, ten hours fitting and two, two-hour written papers. The only machine tools permitted for use in the fitting

exam were a bench drill and shaper.

Photographs 1, 2 and 3 are of my second-year fitting exercise. The two parts obviously hadn't been apart for many moons, but as I was trying to separate them I remembered that the two tapped holes were there to break the seal as both faces had been hand scraped. Looking back I was probably marked down for the riveting!

This was small beer compared with the final fourth year exam which

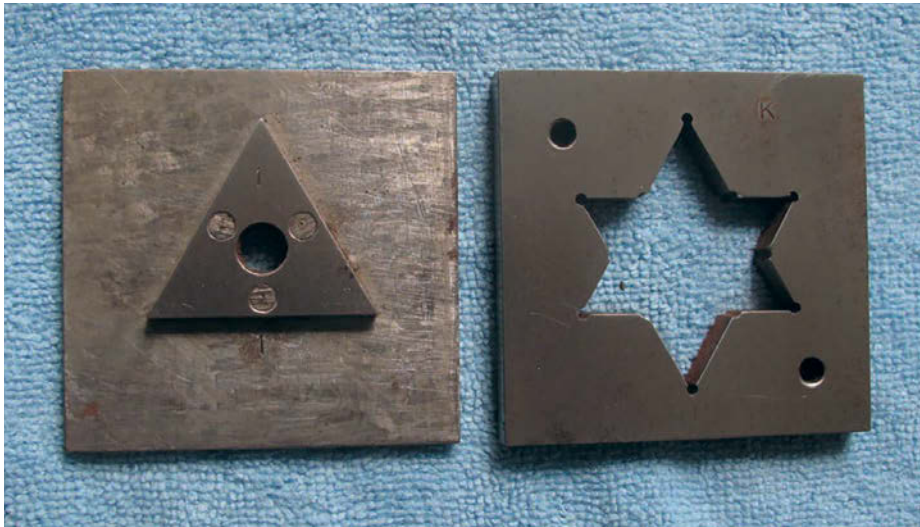


Photo 3: Two halves separated, also visible are the scraping marks.

was designed to replicate a whole working week, this comprised of a forty-hour practical exam and two three-hour written papers. Again the practical exam was divided into two parts, twenty hours machining and twenty hours fitting, with the bench drill and shaper still being the only machinery allowed for the fitting exercise. In order to prevent anyone from 'borrowing' someone else's and

perhaps better approach to producing the workpiece, before the practical test was underway the students had to write their operation sheets with the sequence of operations for both test pieces. These were written under exam conditions. To make sure these were adhered to the examiner would pay unannounced visits to the workshop over the duration of the test to ensure that the student's operation sheet

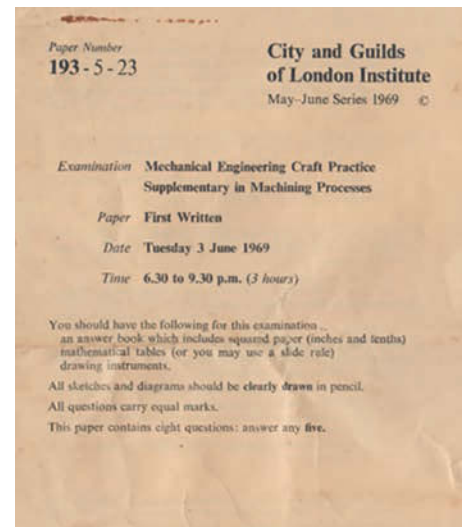


Fig 1: Instructions.

for the workpiece was indeed being followed on the actual test piece. There were marks at stake, as the operation sheet was marked as part of the exam along with the hopefully completed test piece. No pressure there then! Being on day release the practical exam lasted for five weeks, so after each session the test pieces along with all the work sheets and drawings were kept under lock and key until the

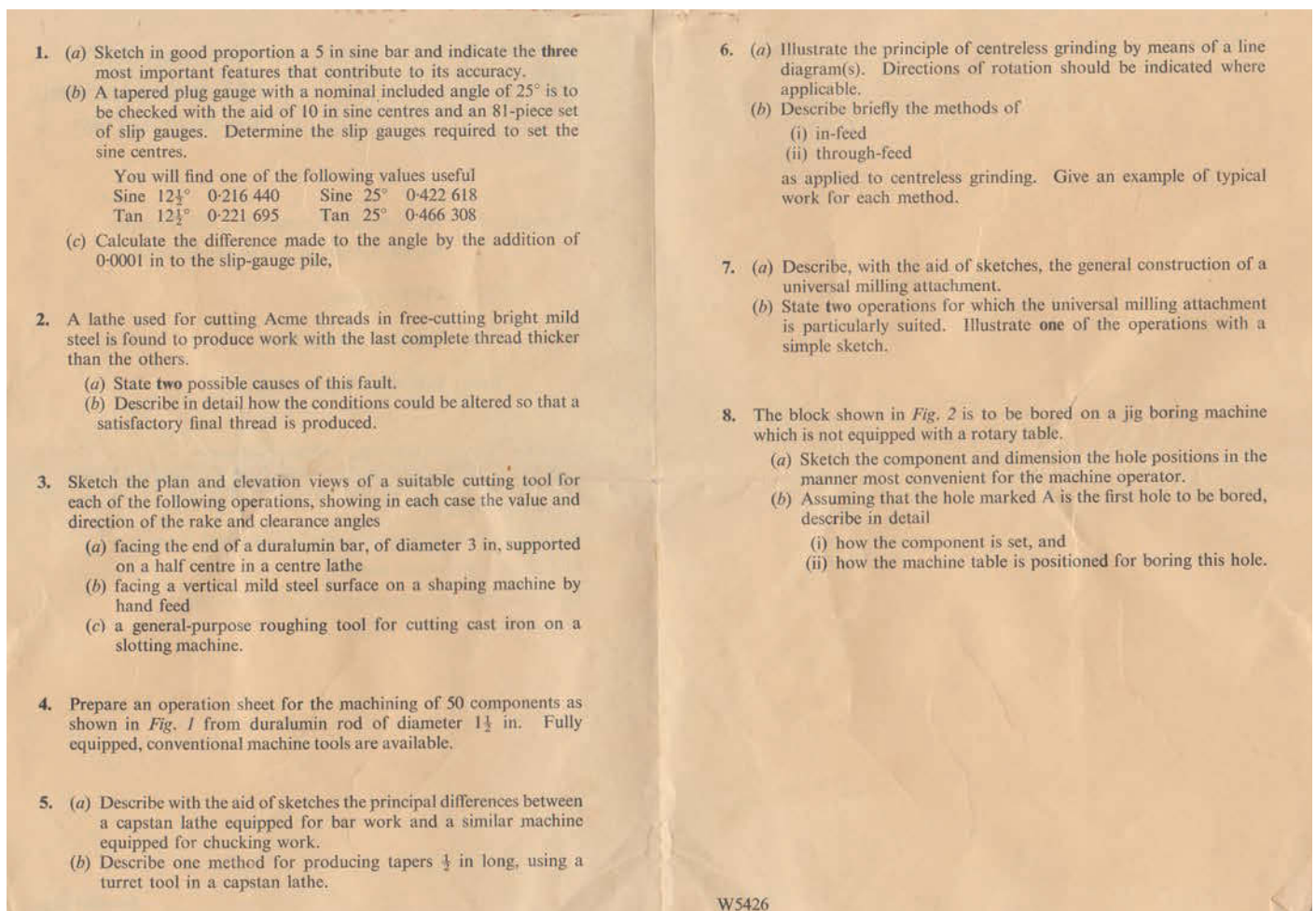


Fig 1: Question choice.

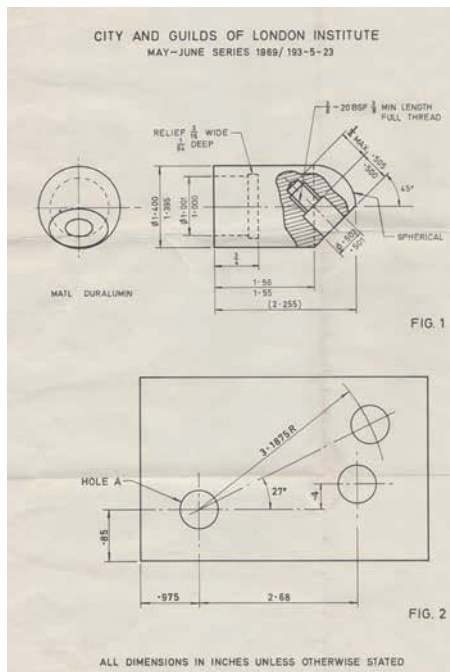


Fig 3: Accompanying drawings.

following week, which removed the temptation of perhaps producing a better example at your place of work.

By the time we reached the fourth year of the course the class size had greatly reduced from the start of the first year! Those of us that succeeded in passing the final hurdle could go on to do a one-year course in machine shop processes, without any practical test this time, but there were two three-hour papers at the end. This, by anyone's standards over the five-year period provided a pretty comprehensive foundation in engineering practice and theory to complement the skills learnt in the workplace.

The overall purpose of the course was to give a broader grounding in all aspects of the trade and allied subjects which was aimed at potential foremen and managers, which in my case proved to be the case. Some of the theory I was taught at the time didn't have any practical use until many years later.

Except for one individual, I completely lost touch with all the others on the course soon after the final exams, and so I have no idea of what happened to any of my compatriots, apart from John, who after several years in production engineering took over his father's fish and chip shop and probably did better than the rest of us put together.

Apart from a whole swath of health and safety considerations and of course CNC machinery I suspect the college workshop of the mid-sixties hasn't really drastically changed from today's. The lathe and milling machine still being the corner stones that they always were. Gone though is the shaper, the capstan

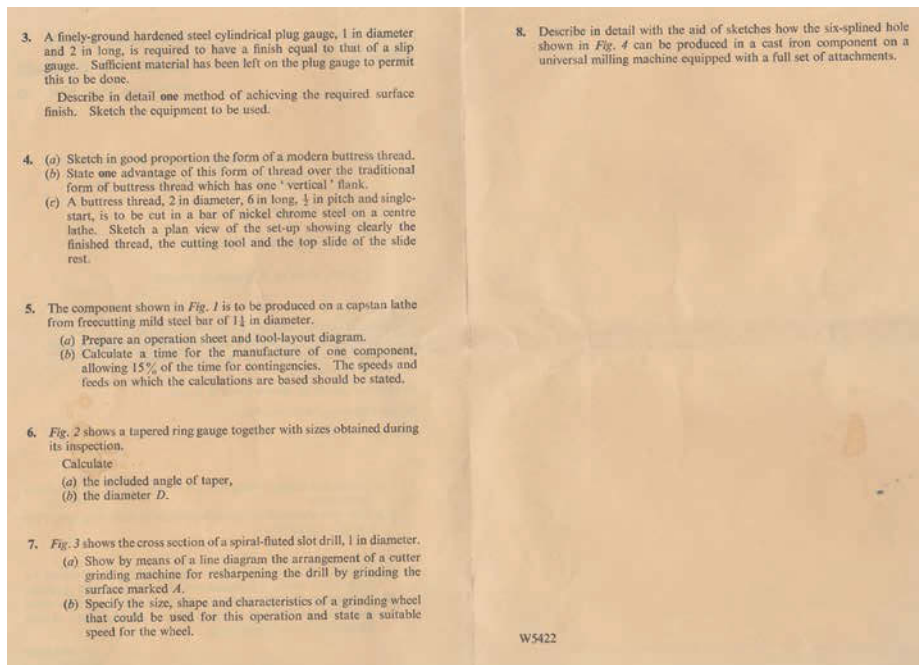


Fig 4: Second paper question choice.

lathe and in the case of the college workshop in which I spent five years, the cyanide hardening bath!

One of the benefits of such a comprehensive course was to enable the student to reach a standard of competence and confidence of working with machine tools that perhaps their own place of work probably didn't have, in my case cylindrical grinding and horizontal boring.

For several years in the early eighties I worked as a contractor in Germany. The German training system was different to the U.K. Each trainee was given a two-month stint on each machine tool and bench discipline. On completion the trainee was assigned to the section where he, or she, had shown the greatest aptitude, this is where they then completed their three year training and that would be the machine or section they would work on, probably for the rest of their working life. While the British way of doing things usually allowed a trainee to continue using all machine tools and increasing his, or her skills.

To digress slightly, the one part of German workshop life I found a bit sad was when a worker reached twenty-five years' service, he was expected to provide breakfast for all his co-workers and the occasional lucky contractor. His workmates would usually decorate his machine or workstation with bunting while he would supply a decent spread of food. As the working day usually started at seven o'clock, the morning break was at ten o'clock and called 'frustuck' or breakfast. The celebrations would only last the usual fifteen-minute break time, where he

was of course the man of the moment, then it was back to work, heads down bums up as if nothing had happened!!

Although as contractors we were employed as an individual trade, turner, miller etc. the Brits were in great demand as they could usually quickly adapt to any unfamiliar machine tools or working environment where there might be a shortage of skilled workers, due, I feel in no small part to the then comprehensive training programmes in the UK. I recall my agency had sent me to a factory on the outskirts of Frankfurt, where, introducing myself in my shaky German I said to the boss, "I'm your new turner"; the boss said he had requested a vertical borer, to which I replied, "I'm your new vertical borer". Though not actually having worked one

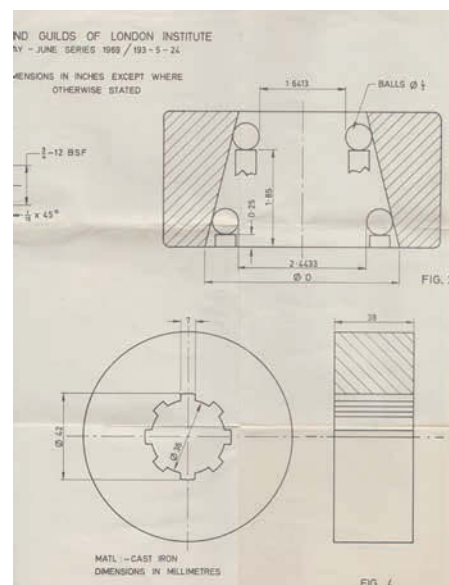


Fig 5: Accompanying drawings.

Back to the training closer to home. Unfortunately going into the eighties and nineties there was little or no government encouragement for employers to send their trainees to college, as not only did they lose a day's production, they were also expected to pay for the privilege. The standard of instruction also fell quite dramatically. When I ran my own small workshop, I had a lad apply to an advertisement I had placed for a machinist improver. At the interview he told me he had achieved a diploma in production engineering from one of the largest colleges on the South coast. On his first day I had to show him how to read a micrometer and vernier. He didn't last too long as I just couldn't afford the time and lost production to teach him the basics. He told me that for long periods of time, sometimes for whole days there was absolutely no instruction and during these times they had to sit in the library and read books on theory. There was also very little practical instruction. Apparently to be awarded a diploma, all you really needed to do was turn up as there

When I left the trade in the early noughties the managements and the government were just waking up to the fact that there was a thirty-year gap between the old hands reaching the end of their working lives and those replacing them. Over the years I've had quite a few apprentices placed in my tender care in order for me to impart my knowledge, none seemed to suffer any permanent damage as a result. While I fully appreciate the engineering landscape has dramatically changed since my early days, with CNC now being dominant, I still feel trainees would always benefit from good impartial off the job instruction in the more practical skills, as along with my practical skills I quite probably passed on some of my bad habits as well. To my mind manual machining skills are still the foundation stone. In my experience you can make a



To close I'll include two fifth year written papers (**figs. 1 to 5**) for you delectation and delight, no prizes I'm afraid and definitely no pocket calculators! 🍷

A Tool and Cutter Grinder

This is the final drawing, for **Paul Lousick's** Grinder design, which unfortunately we were unable to fit in to the previous issue.

PART 5

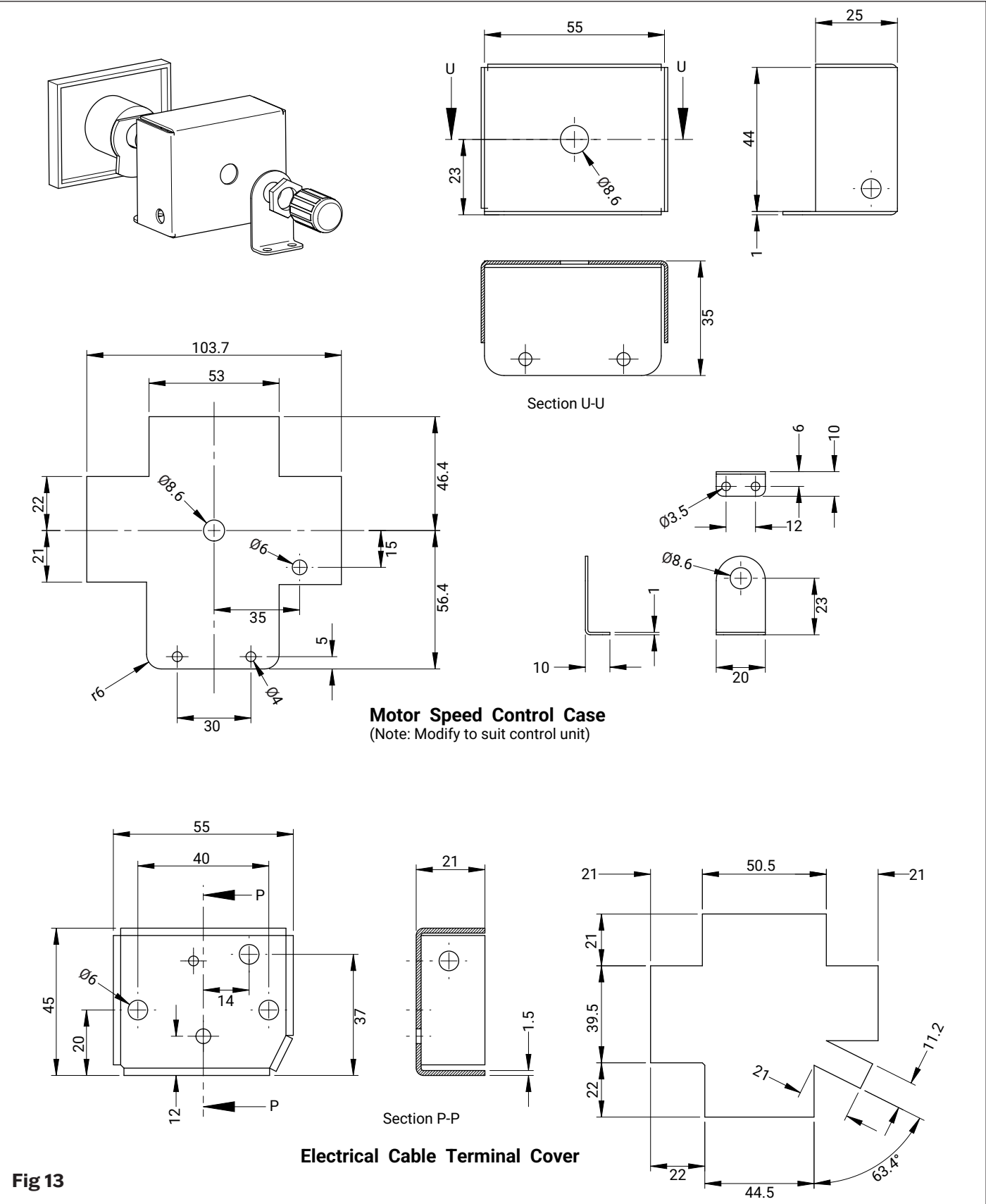
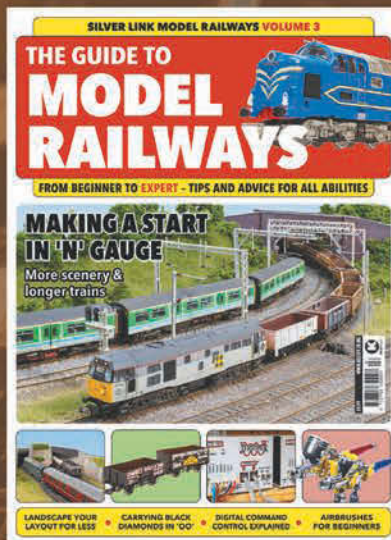
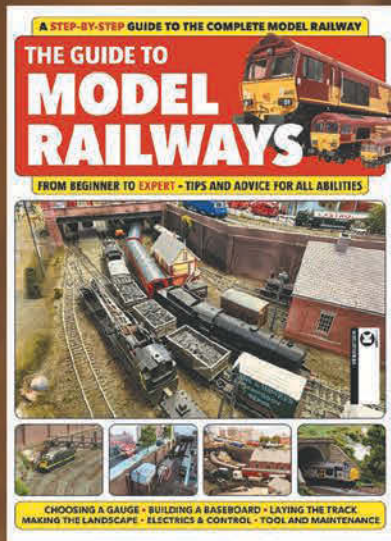


Fig 13

THE ULTIMATE MODEL RAILWAY COLLECTION

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Club Diary

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2026

EVERY SUNDAY

Urmston & District MES

Public Running every Sunday
Contact: secretary@udmes.co.uk

Warrington MES

Running day. Contact :
contact@wdmes.org.uk

Wakefield SMEE.

Public running day. Contact
Denis Halstead 01924
457690

JULY

16 Stafford Model Engineering Society

Running day at County Showground, Stafford. 10:00-14:00. Further information via www.sdmes.co.uk.

18 Brighton & Hove SM&LE

Hove Park Railway public open day. www.hovepark.com

18 Nottingham SMEE

Miniature Diesel Locomotive Gala. For enthusiasts of both battery and petrol-powered diesel locomotive models in 7¼, 5-inch and 3½-inch gauge. You must book in advance with Rob Buxton – buxton845@gmail.co.uk or 07837 272650.

19 Bradford Model Engineering Society

Public running day. Members from 11:30 am, public from 1:30 pm to 16:00, whatever the weather, Northcliff. Contact: Russ Coppin, 07815 048999.

19 Guildford Model Engineering Society

Public running days at Stoke Park Railway. Info and times see www.gmes.org.uk.

24-26 City of Oxford SMEE

Dreaming Spires Rally at Cutteslowe Park Miniature Railway. Open for visiting engines throughout the weekend. Contact 07850 062932 or denis.mulford@btinternet.com to book or for further information.

26 Bristol SMEE

Public Running day, Ashton.

26 Worthing & District SME

Public running day, Field Place. 1:30-4:30. www.worthingmodelengineers.co.uk.

26 Saint Albans Model Engineering Society

Running sessions at Puffing Field. 1pm start, weather dependent.

AUGUST

1, 15, 31 Brighton & Hove SM&LE

Hove Park Railway public open day. www.hovepark.com

2, 30, 31 Bristol SMEE

Public Running day, Ashton.

6, 16, 27 Guildford Model Engineering Society

Public running days at Stoke Park Railway. Info and times see www.gmes.org.uk.

9 Chichester Model Engineers

Public running at Blackberry Lane, Chichester PO19 7FS. 13:00.

16 Bradford Model Engineering Society

Public running day. Members from 11:30 am, public from 1:30 pm to 16:00, whatever the weather, Northcliff. Contact: Russ Coppin, 07815 048999.

16, 30 Saint Albans Model Engineering Society

Running sessions at Puffing Field. 1pm start, weather dependent.

23 Stafford Model Engineering Society

Running day at County Showground, Stafford. 10:00-14:00. Further information via www.sdmes.co.uk.

SEPTEMBER

5 Bromsgrove SME

Bromsgrove SME will be hosting the Rob Roy Rally plus other 3.5" friends all welcome. Contact Doug Collins 07585 524836.

6, 13 Stafford Model Engineering Society

Running day at County Showground, Stafford. 10:00-14:00. Further information via www.sdmes.co.uk.

12, 26 Brighton & Hove SM&LE

Hove Park Railway public open day. www.hovepark.com

13 Bradford Model Engineering Society

Public running day. Members from 11:30 am, public from 1:30 pm to 16:00, whatever the weather, Northcliff. Contact: Russ Coppin, 07815 048999.

13 Chichester Model Engineers

Public running at Blackberry Lane, Chichester PO19 7FS. 13:00.

13, 20 Bristol SMEE

Public Running day, Ashton.

13 Saint Albans Model Engineering Society

Running sessions at Puffing Field. 1pm start, weather dependent.

20 Guildford Model Engineering Society

Public running days at Stoke Park Railway. Info and times see www.gmes.org.uk.

26-27 St Albans and District Model Engineering Society

The BIG St Albans Model Show.

OCTOBER

3 (TBC) Bradford Model Engineering Society

Visitors Day. BMES welcomes members and their locomotives from other societies to Northcliff for breakfast & lunchtime butties. Let Russell know in advance, please: Russ Coppin, 07815 048999.

10, 24 Brighton & Hove SM&LE

Hove Park Railway public open day. www.hovepark.com

11 Chichester Model Engineers

Public running at Blackberry Lane, Chichester PO19 7FS. 13:00.

11 Bradford Model Engineering Society

Public running day. Members from 11:30 am, public from 1:30 pm to 16:00, whatever the weather, Northcliff. Contact: Russ Coppin, 07815 048999.

14, 18, 25 Bristol SMEE

Public Running day, Ashton.

17 Gauge 1 Yorkshire Group

Running day at Drax Power Station social club, 9:30 to 15:30. Bar open for drinks, breakfasts and lunch. All welcome.

18 Stafford Model Engineering Society

Running day at County Showground, Stafford. 10:00-14:00. Further information via www.sdmes.co.uk.

18, 29 Guildford Model Engineering Society

Public running days at Stoke Park Railway. Info and times see www.gmes.org.uk.

18, 31 Saint Albans Model Engineering Society

Running sessions at Puffing Field. 1pm start, weather dependent.

NOVEMBER

14 Gauge 1 Yorkshire Group

Bonfire Night Bash at Drax Power Station social club.

14 Stafford Model Engineering Society

Running day at County Showground, Stafford. 10:00-14:00. (Weather permitting, check Facebook page). Further information via www.sdmes.co.uk.

DECEMBER

5 Gauge 1 Yorkshire Group

Christmas Bash at Drax Power Station social club, 9:30 to 15:30. Bar open for drinks, breakfasts and lunch. All welcome.

6 Guildford Model Engineering Society

Public running days at Stoke Park Railway. Info and times see www.gmes.org.uk.



Bodywork loosely secured for the loco's first exhibition outing in November 2025

The Silver Crest BR Class 1500

PART **5**

Mark Thatcher continues his build of this impressive kit from Silver Crest Models. He concentrates on the boiler, wrapper, smokebox and its associated pipework and 3D-prints his own accessories too.

I am pleased to be making good progress and have been looking forward to tackling this kit, as I could finally move on from fitting working components and running gear and can now start to concentrate on the some of the body parts to help to start beef this model up. I am far more in my comfort zone and would usually spend some time fettling and filing some parts to make them fit on other models. However, as this is essentially a bolt-together kit, I am pleased to report I had no such issues here.

However, unlike my smaller kits, the instructions told me to make the smokebox completely airtight with

some sort of sealant, so it would steam better and this was a new, and somewhat messy experience for me, which I will come onto later.

PREPARING THE BOILER FOR FITTING THE WRAPPER

My boiler arrived with all the back head fittings installed, **photo 1**. The steam whistle valve, pressure gauge, regulator and firebox doors were already pre-assembled, so later on, it looked like all I needed to do was to attach the pipework which was fed up from under the chassis and through the footplate. However, one

pipe that was constantly getting knocked was the blowdown pipe at the bottom of the sight glass assembly. So, my top tip is to remove this pipe now prior to fitting the boiler wrapper.

I also needed to remove the safety valve assembly to allow the boiler wrapper to slide down the length of the boiler unimpeded, **photo 2**. This safety valve is pre-set at the factory, so it blows off before the boiler's maximum working pressure is reached. There were four screws holding this assembly into place and it was an easy job to remove it. I took great care not to damage the gasket between this and the top of the boiler in the process,

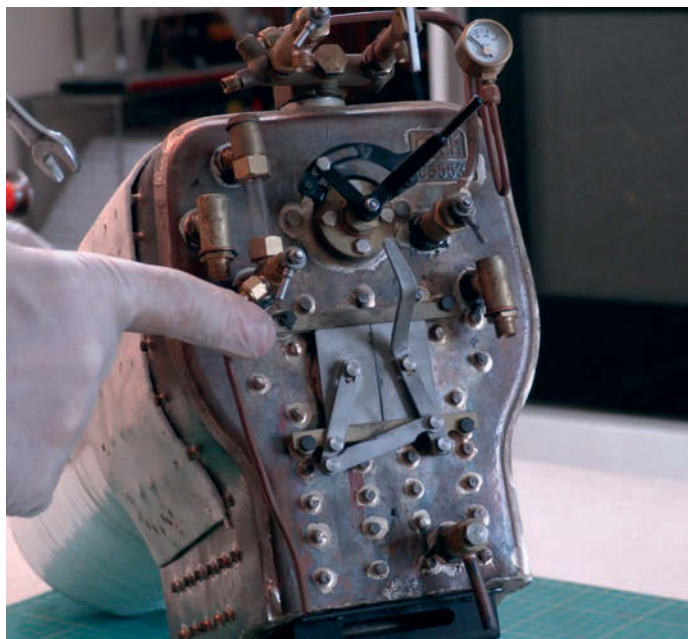


Photo 1: Removing the blow down pipe.

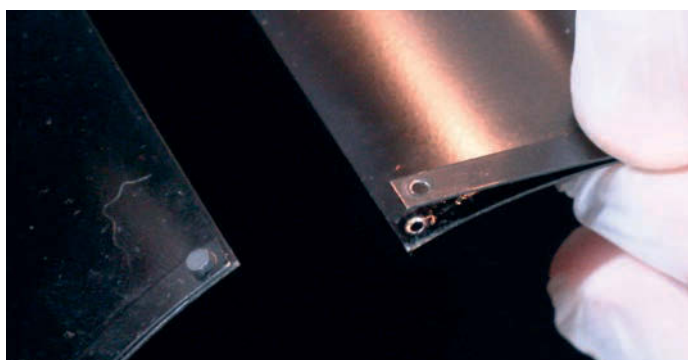


Photo 3: How the boiler bands are secured.



Photo 5: Fitting the wrapper.

although Silver Crest do provide a spare gasket in this kit just in case you damage one. There are four Nyloc nuts locking down the springs of the safety valve. Whilst this may not be the most elegant solution, they do ensure that when the valve has been correctly set it will stay set. In any case, you will barely see these once the safety valve bonnet has been added.

THE BOILER WRAPPER

Photographs 3 and 4 show the way the wrapper is secured to the boiler. Each of the four boiler bands are held in place with 3mm bolts that slide through oval holes in one end of the brackets on the bands and then are into threaded holes in the other. This provided a little wiggle room that allowed me to tighten the

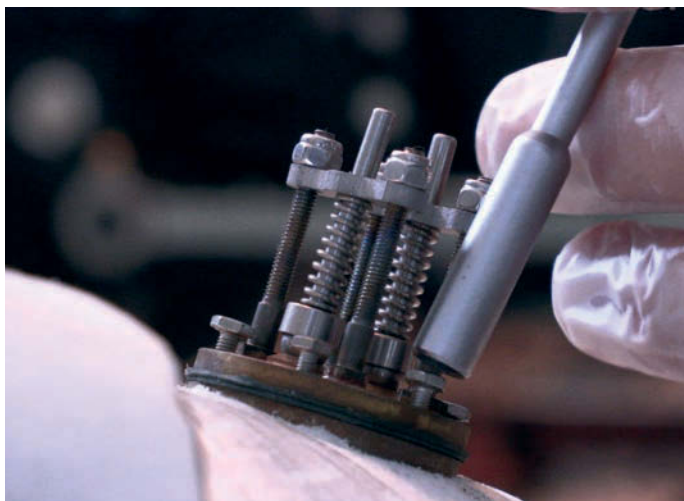


Photo 2: Removing the safety valve assembly.

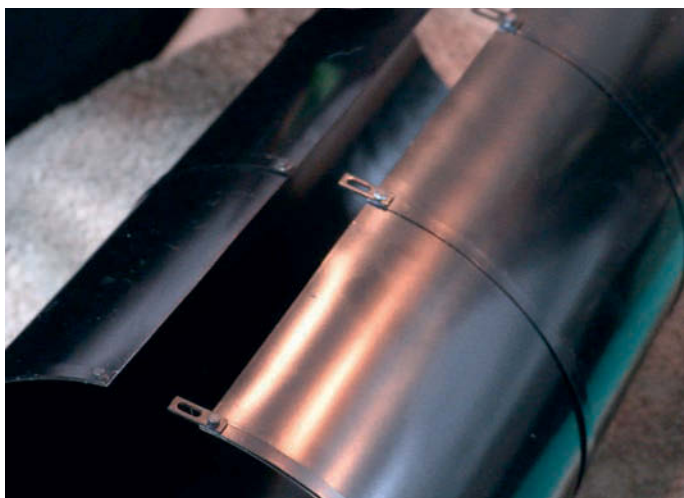


Photo 4: boiler band brackets.



Photo 6: The brass safety valve bonnet.

bands up securely once the wrapper was roughly in place. The boiler bands are fitted up to the point roughly 15mm aft of the safety valve and seemed well spaced down the length of the wrapper to securely hold it in place. The rest of the boiler and particularly, the firebox, will be hidden by the firebox top cover later on in the build. The spacing of these bands is nominal though, although they come



Photo 7: Test-fit of the top feed pipe cover.



Photo 8: Back head and smokebox pipework.

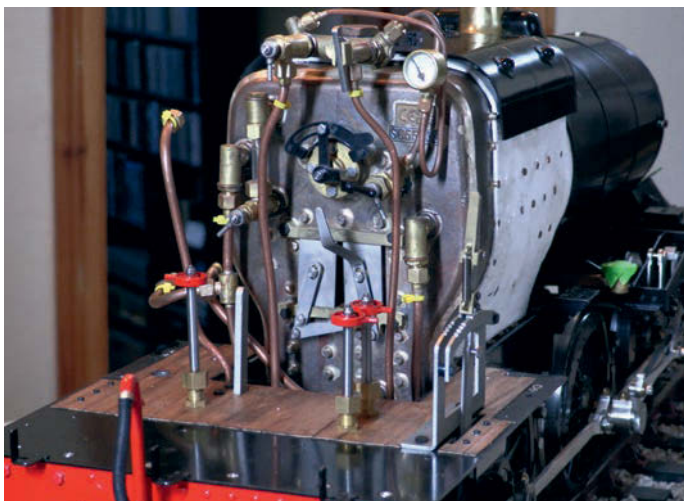


Photo 9: Banjo bolts held in place with zip ties!.

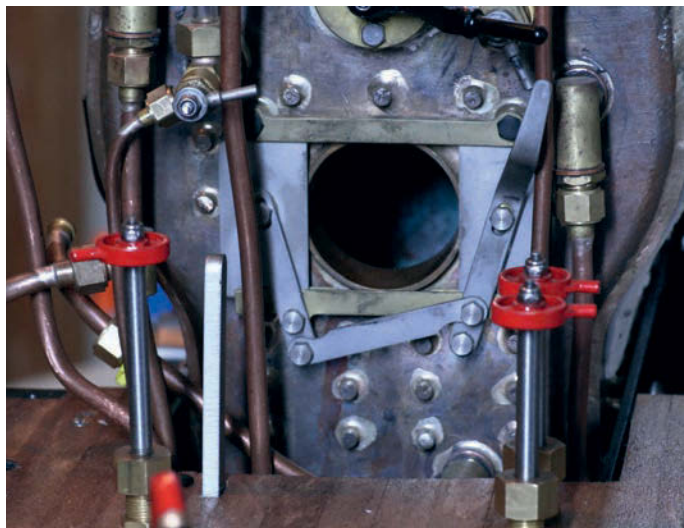


Photo 10: Controls protruding through footplate.

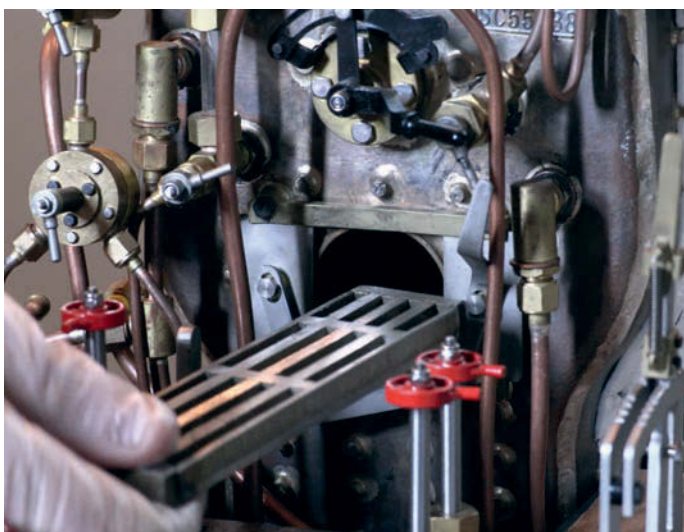


Photo 11: Inserting one of the two grates.



Photo 12: A very messy job with Fireweld.

loosely attached to the wrapper where they are located, so I made a note of these points before removing the bands.

Fitting the wrapper was definitely easier with two people, **photo 5**. Luckily the safety valve gasket remained attached to the boiler which made refitting the safety valve assembly very easy.

In fact, we used the hole in the wrapper where the safety valve was

located as a good reference point to position the wrapper and, once we were happy with the fit, we could then fully tighten up the boiler bands. All that remained to do was to refit the safety valve assembly. It would fit either way around, but I did mark the orientation of it before I removed it in case there were any tolerance issues. As a nice little reward for this work, I was then able to add the first piece of

brightwork to this model: the brass safety valve bonnet, **photo 6**.

Another little detail that was also added at this point were the two top feed covers. On the real loco, these would hide the two top feed steam pipes to the safety valve although this pipework is not present on this model, but it was nice to see the covers in place to give the illusion that they are hiding the pipework underneath in any case, **photo 7**.

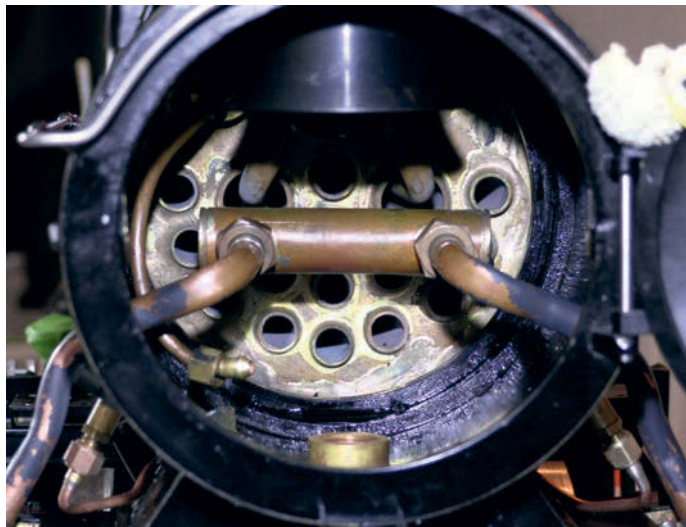


Photo 13: Smokebox pipework.



Photo 14: Steam pipe from cylinder.



Photo 15: Sealing the pipework with more Fireweld.



Photo 16: Turret boss..

BOILER BACK HEAD PIPEWORK

Photograph 8 shows the relatively small amount of pipework that was to be added to the back head of the boiler and to the inside of the smokebox. The rest of the pipework was already protruding up and through the footplate and it was pretty obvious where all these pipes went. As I did not want to spend hours hunting for the various captive bolts that would inevitably slide down the pipes with nipples on, and into the bowels of the loco, I held them in place with cable ties, so they remained visible and easy to get to. Once these were tightened up, it was a two-minute job to snip the cable ties off, **photo 9**. Note: the two unattached pipes to the left of this photo would eventually be attached to the water feed and return pipes that feed into the left-hand side tank, that also contains the manual water pump. This pipework can't be fitted until the cab is in place later on.

Photograph 10 shows the arrangement of the various control wheels and stands that protrude through the footplate, which could now be bolted into position to secure them from the top of the plate. Once I was happy with the general arrangement of the pipework, I could now reattach the sight glass blow down pipe. Before I got any older, I test-fitted getting the two fire grates into place, **photo 11**. There are two of these and each one drops into the firebox through the open firebox doors. It was a fiddle with a poker to try to position these side by side and to get them to line up properly. I would have much preferred an arrangement where there was only one grate which could have been pulled out from underneath, when the firebox base was removed to drop the fire after running.

SEALING THE BOILER WRAPPER

Photograph 12 shows my frankly tragic attempt to successfully seal the

wrapper to the boiler. The instructions did clearly state that all areas around the smokebox should be well sealed to prevent any escapes and I knew I would have a hard job if I fitted the pipework in this area before doing so. My first attempt was a massive fail using *Hot Spot* fire surround cement, dispensed from a caulking gun. It went everywhere and was a mess to clean up. I coped better with *Fireweld* in a more controllable smaller tube, which spread better, but it was still far from perfect.

After this messy task was completed, I could then marry the smokebox up to the boiler, **photo 13** and fit the steam pipes from the cylinders, through the holes in the smokebox and connect these to the boiler. **Photograph 14** shows the arrangement of these pipes and the oversized holes in the smokebox that will also need to be sealed. These pipes are handed but it was pretty obvious which way around they went.

Please ignore the semi grey look of these pipes with paint flaking off. I



Photo 17: ModelU 5" gauge 1500 loco crew pack ready for paint.

wrongly assumed these pipes would be exposed, so painted them grey without priming the parts – whoops! Well, they will be covered later and were badly primed by me also, so I learned two lessons in one here. What is it I say? *'I make the mistakes (and there are plenty of these) so you don't have to.'*

Once most of the pipework was connected, I then went back to the *Fireweld* for the final time and completed the sealing up process, **photo 15**. I was still not pleased with the results I achieved as *Fireweld*, whilst being more malleable than *Hot Spot* fire cement, was pretty unpleasant to use, and so result I got was the best I could do. Hopefully, when the smokebox door is closed, I'll forget about the mess I made. On the plus side, once this gloop had set, it made for a flexible yet good seal, and my hope was I had added enough to completely seal the smokebox. Of course I won't know this until the first test-steam up.

To complete this stage, the small round turret boss was screwed into place, **photo 16**. At least this is what I think this part is called, but there are so many names and terms I am still learning, so please feel free to correct me if I have got the name of this part wrong! I also was far too keen to add the smokebox door, which I ended up cable-tying open, as it had the propensity to close itself of its own accord and invariably would do this at the most inopportune moments. If I ever do this again, I'll leave fitting the door as one of the last things I do.

MY ADDITIONS AND AUGMENTATIONS

As a reward to myself, after this fiddly little build, I retreated to jobs I am far

more comfortable with – adding my own details and returning to making and painting things. First up, I ordered two loco crew figures from *ModelU*. This company has some very finely detailed 3D-printed figures in a variety of scales from OO to 1/19th scale, which is my preferred scale for my 16mm (SM32) locomotives I normally work with. However, for anything bigger than this, it is an easy job just to drop them a quick email as they can scale any of their crew figures to suit the size of your loco. I recall my class 1500 loco crew pack containing two figures came in at around £90 for the set, **photo 17**. Their website is www.modelu3d.co.uk. Hopefully by next time, I will have had a chance to paint the crew.

I was also keen to grab some 5" scale BR style loco lamps. These were a challenge, as the class 1500 locos were originally designed for the GWR to a Hawksworth design. But when they rolled-out they were for British Railways (Western Region) in 1949. So, the lamp brackets on this model were fitted as a GWR type, with the bracket facing laterally to mount a standard conical-shaped GWR lamp from the side, whereas the standard BR lamp bracket is set longitudinally to mount the square BR lamp at the back. So, I needed a square lamp with a mount at the back. I did find some lovely brass versions of these, but if I wanted to run the loco in an express configuration I would need several, so buying these would have been beyond my budget. To overcome this, I decided to have a go and 3D-printed my own.

Photograph 18 shows my efforts. The lamp holders were printed separately so I could mount these to the lamps in either configuration



Photo 18: Mark's 3D-printed BR-style lamps.

to suit both BR and GWR variants. I purposefully printed these lamps with a hollow inside to the print, as I thought I may have a go at dropping in some 9v 3mm LEDs to turn them into working lamps. But for now, and as I do not have the process of making clear lamp lenses, I just drizzled two-pack Araldite resin adhesive into the hole, then let a convex meniscus form at the top to simulate the shape of the lamp lens. Making the white lenses was easy, but colouring the resin red for the tail lamps did not go so well. Hopefully, further down the line I will find a way of improving this.

Either way, for a bit of PLA filament and a few hours to print a set of three lamps out on one print bed was achievable relatively quickly and was far more cost effective than buying three brass lamps. Now I have the STL and GCODE print files, I can print as many as I like. Of course, the brass variants are far nicer than my 3D prints, but if you employ the four-foot (or is it six-foot) modeller's rule, I doubt you will see much difference.

Next time I will be adding the water tanks and cab body and also smaller details and parts that some refer to as the '*loco jewellery*'. This stage will really appeal to the OCD in me and I always like to add these finishing touches to bling up and breathe life into my models in the smaller scales that I mainly work in. Hopefully by now you have found my channel on YouTube. Just as a reminder, my channel's name is **MADforSTEAM** and I really hope you find time to dip into this build series on there as I go into far more detail in these videos. If you like what you see, then please like & subscribe too. It's free to do this and helps my channel to grow. Until next time, happy steaming!

To be continued

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- | | | | |
|---|----------------------------|---------------------------------|-----------------------------|
| • Stainless steel motion | • Choice of liveries | • Piston Valves | • Superheater |
| • Boiler feed by axle pump, injector, hand pump | • Painted and ready-to-run | • Walschaerts valve gear | • Reverser |
| • Etched brass body with rivet detail | • Coal-fired live steam | • Drain cocks | Approx Dimensions: |
| • 4 Safety valves | • 5" gauge | • Mechanical Lubricator | • (L) 80"x (W) 10"x (H) 14" |
| | • 4 Cylinder | • Silver soldered copper boiler | • Weight: 116 kg |

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Early Developments In Hydrostatic Transmissions

PART 2

Mike Tilby of the Society of Model and Experimental Engineers (SMEE) looks at some of the practical aspects of using hydraulic power transmission.

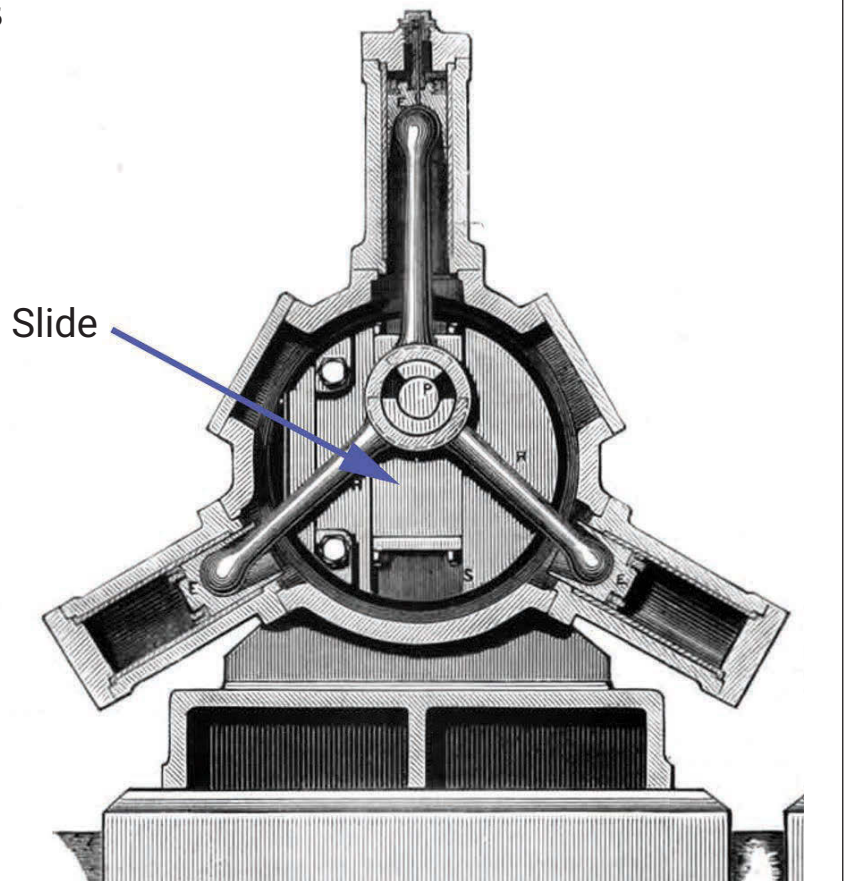


The first article in this series outlined the general nature of hydrostatic transmissions and gave some background to hydraulic mechanisms in general. Before turning to what seems to have been the first variable speed hydrostatic transmission for a vehicle, we should look at design implications for the incompressible nature of hydraulic fluids.

HYDRAULIC VERSUS STEAM POWER

With respect to motors based on reciprocating pistons there are important differences between those powered hydraulically and those powered by steam. When driving a light load, the economy of a steam engine can be improved whilst maintaining the rpm, by partially closing the stop valve or, better, by advancing the cut-off. Both changes result in reduced consumption of high-pressure steam since the steam expands more to fill the cylinders, thereby reducing the average pressure acting on the piston and hence reducing torque. Hydraulic fluid is essentially non-compressible and so there can be no expansion. Therefore, regardless of load, the full flow rate of high-pressure fluid must be consumed for any given rpm. The only way to economise on the consumption of high-pressure liquid when only a low torque is required is to reduce the stroke of the engine. The importance of economising use of high-pressure water prompted the development of the Hastie-Brotherhood hydraulic engine, **ref. 7**. The prominent engineering company of Peter Brotherhood had been manufacturing small radial hydraulic motors of fixed stroke in which the pistons acted on a central crank pin. However, in 1885 they started producing a version in which the crank throw was

Fig 5



automatically adjusted to maintain a desired torque on the output shaft, **fig. 5**. As the throw was reduced, so was the fluid consumption per stroke and so also was the torque exerted on the shaft – for the same hydraulic pressure.

The lack of compressibility of hydraulic fluid also means that inlet and exhaust valves of reciprocating engines must open and close at top and bottom dead centres otherwise the engine will halt because it becomes hydraulically locked. Another consideration is that sudden valve closure can result in the build-up of high, possibly damaging pressures, as

in severe water hammer, because of momentum of the flowing liquid. This is particularly relevant when water is used (as opposed to oil) since it has a high density and a low viscosity.

MR RIGG'S ROTARY MOTOR

Mr Arthur Rigg patented his hydraulic motor in England in 1885 and in the USA in 1887, **ref. 8**. It comprised three (or more) radial cylinders with pistons that acted against an encircling ring, **fig. 6**. At the centre of the cylinders was a rotary valve while the outer ends of the piston rods were attached to the

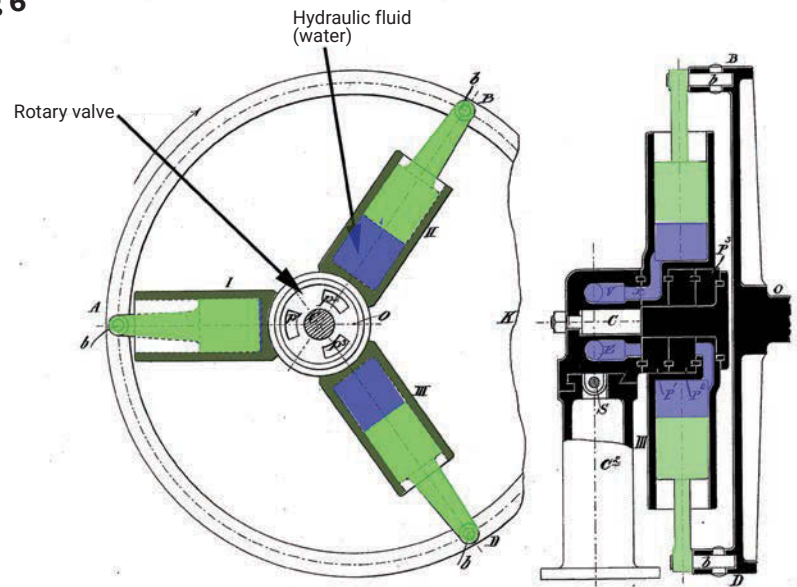
ring via pivots. The cylinders, piston and ring all rotated around the central valve, but the axis of the ring could be offset from the centre of rotation of the cylinders. In addition to being compact, an important aspect of this design was that it enabled the stroke of the pistons to be adjusted simply by changing the offset between the centres of the outer ring and the valve/cylinders. Clearly, if the two were coincident then the stroke was zero.

We'll see this type of mechanism for changing the stroke of motors or pumps applied in various types of hydrostatic drive.

THE HALL VARIABLE SPEED APPARATUS

The earliest example of what might these days be described as a hydrostatic transmission seems to have been invented by Mr J. W. Hall, who obtained a patent for his *Variable Speed Apparatus For Transmitting Power* in 1897, **ref. 9**. This invention was intended for automobiles and was devised at a time when gear boxes were far from the easy to use mechanisms that we have come to expect today, and transmission was often via chain and sprocket. Mr Hall's ingenious mechanism is a little complicated and so, hopefully to improve clarity, I have applied colour to the key components in an original

Fig 6

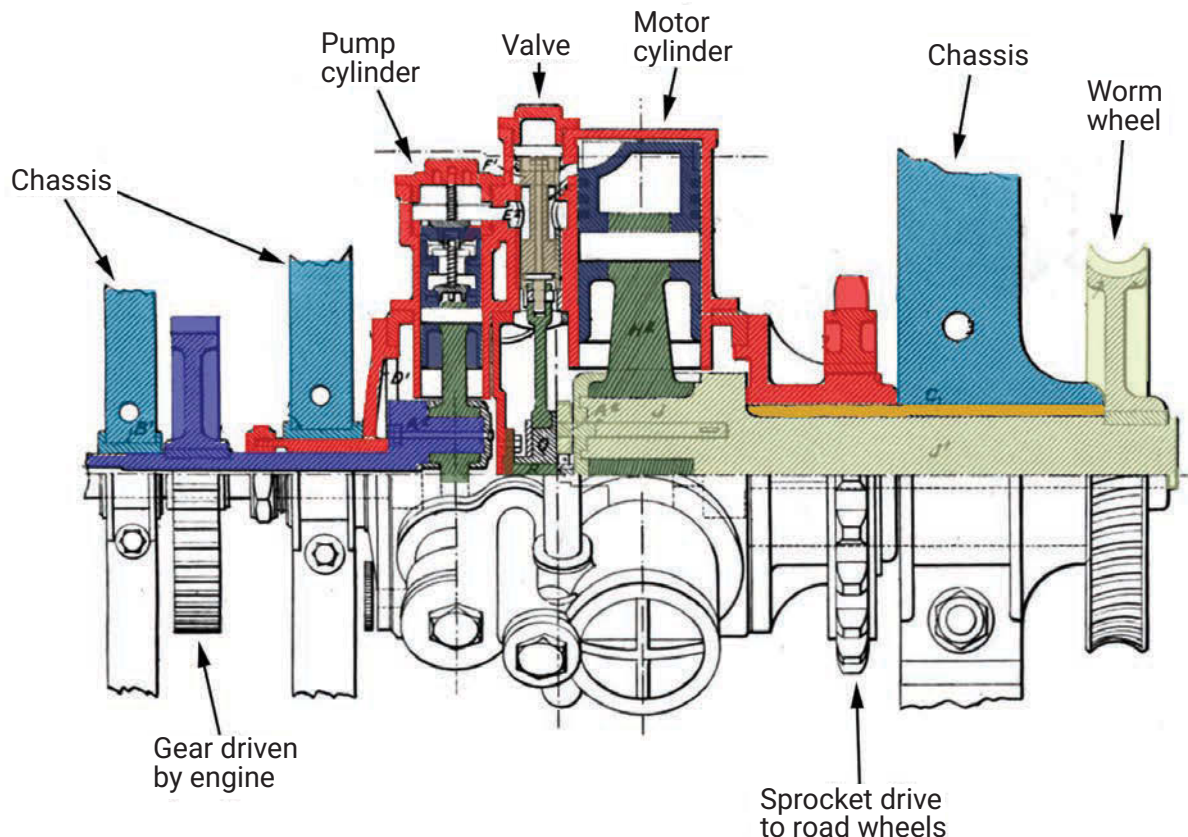


sectional drawing, **fig. 7**. The device consisted of a radial three-cylinder pump in which the crankcase was full of hydraulic fluid. Fluid entered the cylinders via a oneway transfer valve in each piston and was delivered via non-return valves in the cylinder heads. The crankshaft of this pump was driven by the engine of the vehicle via the gear wheel. The three pump cylinders delivered the fluid into a common duct, **fig. 8**. When a manually controlled bypass valve was open, fluid

was allowed to return to the pump's crankcase without doing any work on the hydraulic motor.

The motor part of the apparatus was also a radial three-cylinder design, but the cylinders had a larger diameter than the pump cylinders. Between the pump and the motor were three radial piston valves operated by a return-crank mounted on the crankshaft of the motor. This crankshaft was essentially stationary relative to the chassis of the car. It could rotate to a

Fig 7



limited degree but only when the driver of the vehicle manually adjusted the worm wheel on right hand end of the apparatus (fig. 7). With the crankshaft fixed, the only way the hydraulic motor could operate was by rotation of the cylinders. This was possible because the pump cylinders, the valve housing and the hydraulic motor cylinders were all part of a casing that was mounted in a bearing at each end (in this respect it was analogous to Mr Rigg's hydraulic motor). A sprocket was attached to the casing, and it drove the wheels of the vehicle via a chain.

At the left-hand end of the apparatus in fig. 7 the input shaft passed through the centre of the left-hand journal of the casing. At the right-hand end the casing rotated on a journal that was also the bearing for a bush that housed the crankshaft of the hydraulic motor. The bore of the crankshaft bearing was offset from the centre of the bush by a distance equal to the throw of the crankshaft. Therefore by rotating the crankshaft via its worm wheel its effective throw could be varied smoothly between zero and maximum. This apparatus operated in several different modes.

With the engine running and the by-pass valve fully open there was no significant pressure in the fluid and the car remained stationary. With the by-pass valve fully closed the pump pressurised the fluid which then acted on the motor via the valves in the following ways:

- If the throw of the motor crank was set to zero the valve was designed such that no fluid could progress through the motor and so the pump became locked due to back-pressure. This forced the pump cylinders and the whole attached casing to rotate at the same speed as the input shaft driven by the engine. This gave the maximum speed and minimum torque to the output sprocket.
- If the throw of the crank of the motor was set to maximum the pump body and case would all turn due to the back pressure in the pump and also due to the force exerted by the motor. Since the motor cylinders had a larger diameter and longer maximum stroke than the pump cylinders, a larger force was available compared to the force that was acting on the pump pistons. For example if, at full stroke, the capacity of a motor cylinder was double that of a pump cylinder, then it took two strokes of the pump for every

stroke of the motor. However, since the cylinders of the pump also rotated it actually took three rotations of the input shaft to give one rotation of the output sprocket and this gave maximum torque. Thus, by adjusting the crank throw by turning the worm wheel, the speed and torque ratio could be varied smoothly between 1:1 and 3:1. Also, by adjustment of the by-pass valve it was possible to gradually reduce output down to very low speeds.

Overall, the efficiency of this hydraulic gear was less than that of toothed gearing. Losses were mainly due to friction from rapid flow of the hydraulic fluid, and this flow was greatest when operating at the lowest output speed. When operating at maximum vehicle speed there was no fluid flow since pump and motor were locked together. It was envisaged that a vehicle would spend most time operating at its highest speed and so this condition was considered to be the most important for attaining best efficiency.

An account in 1899 in *The Engineer*, **ref. 10**, stated that a car fitted with Mr Hall's apparatus was found to perform very smoothly and its speed could be easily adjusted using just a small hand lever. Another article in the trade press in 1907 by the eminent engineer (and a past President of SMEE), Professor Henry Selby Hele-Shaw, **ref. 11**, stated that Mr Hall's gear had been fitted to heavy vehicles and upon opening up the gears it was found that:

It has stood a test of two years' working under the most trying conditions, and has come through

the trials without showing any signs of depreciation, or, ... without needing any attention or repairs. One thing is certain, that, if we add together the four advantages of (1) continuous variation, (2) silence, (3) absence of any need for attention or adjustment, lubrication, etc., and (4) durability, they will together, loom up very large in the eyes of a user as against any possible losses which may occur when the gear is being used for running in bad ground or climbing hills.

Mr Hall's mechanism was unusual in that the hydraulic motor had a variable stroke. In later more widely adopted designs it has been the pump that has a variable stroke.

The next article in this series will describe Professor Hele-Shaw's own design for a hydraulic variable speed apparatus and how it was used in a petrol-engined railway vehicle.

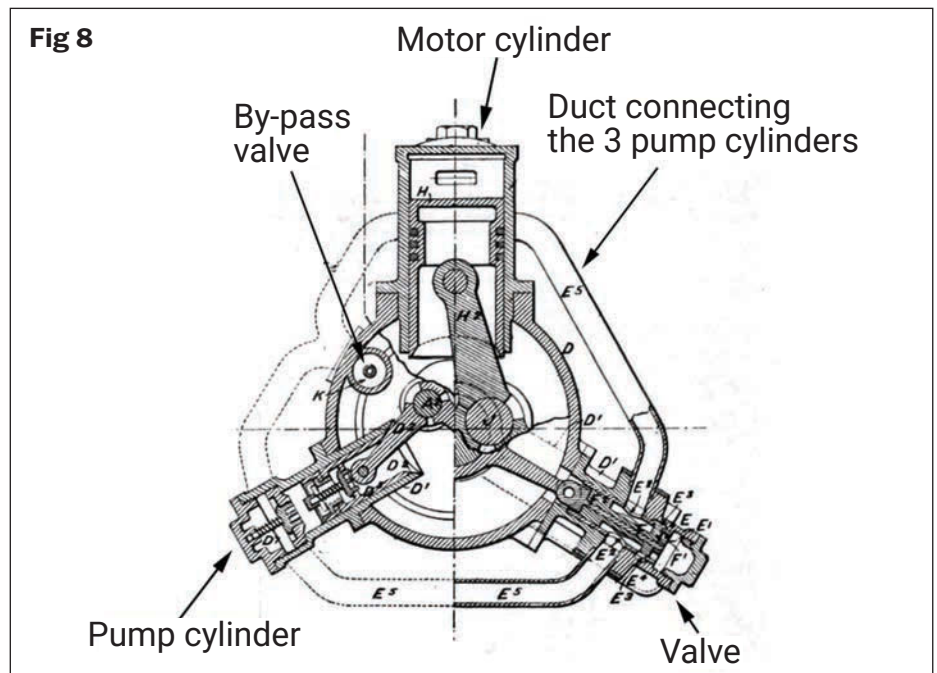
To be continued

REFERENCES

Part 2

7. Anon. (1885) The inventions exhibition - The Hastie-Brotherhood hydraulic engine. *The Engineer*, 12 June, p 453.
8. Rigg, A. (1887) *Engine*. US Patent Office: Letters patent No. 368.424.
9. Hall, J.W. (1897) *Improvements in or relating to variable speed apparatus for transmitting power*. UK Patent No 6590/ A.D.1896
10. Anon. (1899). A hydraulic variable speed gearing. *The Engineer*, 13 Jan, p.39
11. Hele-Shaw, H.S. (1907) The Hall hydraulic gear explained. *The Commercial Motor*, 17 January, p 438 - 441.

Fig 8





Club News

Geoff Theasby reports on the latest news from Model Engineering Clubs.



Photo 1: Harbour at Neepsend model railway exhibition.

Debs and I attended the Neepsend model railway exhibition in Sheffield, with 13 layouts to admire, and a paragraph for each in the brochure, written by the builder or a club rep. Here is a non-railway picture, **photo 1**. In this issue: poor brakes, steamboats, a CV, song writer, a retiring editor, purple prose, not shocked, and power mosfets. *The Frimley Flier*, for May, from **Frimley and Ascot Locomotive Club** begins with a picture of all the parts for new passenger coaches, made by John Cross and Peter Gardner. As we heard before the new rolling stock was hindered by the weak braking systems, this has been rectified before they entered service. Paul Naylor took a break from steam locomotives and bought a model boat. Named *Sundowner*, she represents the Dunkirk 'Little Ships', and he wrote twenty-eight articles for the Federation of Model Engineering Society's library explaining how he did it. A steam boat has been acquired by Nigel Valvona. She has a marine boiler, and Stuart Turner Twin engine, all radio controlled.

He is also restoring *Old Rube*, a 4-6-0 American outline locomotive. Andrew Douglas has been voted in again as editor ("Alas", he says). He and his grandson spent many hours recovering spent ballast. He has painful knees, but he was able to spend long periods working at ground level, with little need to get up at intervals. In checking for the URL which, where possible, concludes every club paragraph, I note that F&ALC does not quote theirs in the newsletter, I obtained it from their Facebook entry. Please, Editors, it makes my life a little easier. www.flmr.org My CV, now unlikely to be used again in anger, being unhelpful to model engineering as it is in the fields of Taxation or Satellite Communications, appeared when I was preparing some of my documents and articles written since 1967, which now amounts to a pile two feet high. I was once involved in a small way in musical theatre in that I rewrote a song from G&S's *The Mikado*, *Early One Moring*, *Just As The Sun Was Rising*. My friends and I were scheduled to meet in Cleethorpes, (well, everyone's got to

be somewhere) and I was wide awake at 5am, not having anything to read, I began composing a parody of a well-known musical item, as you do. Musing upon the *Three Little Maids*' song, it struck me that it would lend itself very well to our forthcoming activities, and the organisers liked so much they included it in the programme. I maintain that it was the three organisers of the event, who sang it a capella, who were worthy of credit. My 'Aria Manager' agrees. It goes like this: *Three little maids from Goole are we, Filled to the brim with girlish glee Out for the day with friends in Clee Three little maids from Goole One little maid is a bride Yum-Yum One little maid in attendance come One little maid from the cold is numb Three little maids from Goole* The **7 1/4 inch Gauge Society**, sends its Summer News. In an impressive editorial, Tim Coles and Helen Haye have spoken! Some prospective members thought we only dealt with narrow gauge designs, or that it is a club for older men. Not so, says the President, Ivan Hewlett, who has written a piece on the recent Mini



Photo 2: Steaming bay at Surrey SME.

Gathering, at Surrey SME, **photo 2**. He had been working hard to foster junior membership and has been instrumental in pushing for a Junior Day in two locations – run for the juniors, programme for the juniors. Also, The Proficiency Scheme is open to all and further knowledge is gained by proceeding through various achievement levels. The Gold award is currently being revised and enhanced. Mike Cave and wife, Lorraine, had long wanted a bridge over their pond/lake. Mike was doubtful on how it might be done but Lorraine had the design all worked out before work began. Ivan's wife and son went to the Junior Day at Riverside Miniature Railway, St Neots. Mother Jane said "My son can drive his own train!" In case this sounds exaggerated, said son, Joe, has a degenerative disability, a full-time wheelchair user, and is non-verbal and with severe learning difficulties. He was welcomed by the members of Riverside, who obtained a special controller from 4QD. This has a speed limiter, and a supervisor's safety cut out in case of any sudden crises whilst out on the track. He performed his driving task successfully, Well done all! Chris Baker made concrete sleepers in quantity, Wood had been tried, until

creosote was banned. About 30 years ago, he bought a house with enough room to make a GL 7 ¼ gauge line in the garden. He thought it would take about 5 years. It still isn't finished and he still thinks it will take about 5 years more. *C'est la vie*. He used fifty-two moulds, and as each one was curing, (underwater, in fact, it enhances the finished product) the mix was being vibrated, on a curing table as suggested by a Professor of Concrete at Zurich University. John Edmonds wrote a history of the Beer Heights Railway. David Hatherill writes some more history of the Society. In it he notes that the first small scale narrow gauge loco, was built at Boston Lodge in 1869. She was named *Topsy*, which caused me to wonder when Uncle Tom's Cabin was written, as it featured a young character of that name. Harriet Beecher Stowe published her famous book in 1852. That sorts that out! Probably the first narrow gauge live steam 'ride-behind', model was *John Ridd* possibly built in the 1930s. www.sevenandaquarter.org. *The Prospectus*, June, from **Reading Model Engineering Society** has an editorial thanking John Billard for the hard work he had done as Editor. That's twenty years and 250 issues making *The Prospectus* what

it is today. A temporary editor has been appointed, as a good magazine cannot be allowed to die, so if any of my readers would like the task, (which I find really enjoyable for my part). This is also the last newsletter to be produced with the MicroSoft Publisher program as MS support for



Photo 3: Variable speed transmission at Wortley Top Forge).



Photo 4: Wimshurst machine, every home should have one.

which is being withdrawn. John Billard replied; he also found the Stephenson valve gear frustrating to set up, but when done, he bolted up the cylinder covers, oiled around, made a feed water connector, started the air supply and opened the regulator... "and away it went!" This, he was not expecting! '61249' recalls the day when at Bath Road running shed, 75029 *The Green Knight*, ran a hot box and was taken off the train to Shildon for the 150th anniversary. He did learn a valuable lesson that day too. Underneath, a loco drops cold water on you which is uncomfortable. It also drips hot water on you and that hurts as well! David Scott tells how to build a Plymouth CR-8 (a Bo-Bo with 4 axles, made in the USA, M'lud). The following article is about a bogied tank loco which predated *Leader* by 50 years, built for the Ouest railway in France, it too was cancelled after a couple had been built, due to complexity and weight. The 'impossible' station and goods yard, as previously printed in Club News, is great fun! Alec Bray writes on the table of classification of loco types which grew as their abilities to pull greater loads increased. www.rsme.uk

Otago Model Engineering Society's Conrod says that they use the JMRI control system, which had problems with interference to the DCC control system until a 'hole' in the electronic computer firewall was made to let the control signals through. (So, JMRI fixed it then? - Geoff). Ian and Murray are building miniature hovercraft, Ian's skirts(!) are made of 80 balloons, and it is expected to reach 50kph. The society has again been requested to stand at the Auto Spectacular, in Dunedin. This great show features cars of all styles and ages and is a must for all car enthusiasts. www.omes.org.nz

The DAF varispeed drive was not original, this is an exhibit at Wortley Top Forge with a very heavy-duty version, **photo 3**. As I write this on the 7 June, watching the *Big Bang Theory* on tv (the one where the flatmates bought a 'time machine' and neighbour Penny complained about having such a monstrous artefact in the flat). As it happens, this is not so far-fetched. I have a Wimshurst machine, *Ainsbury*, on our coffee table, which puzzled the Parkinsons speech therapist who visits me periodically, and also impedes visiting grandchildren. They weren't shocked... **photo 3**.

Welling & District Model Engineering Society magazine, June/July, covers the usual items that everyone has to, and then introduces an interesting concept. Four Maxitrak F7 bogie chassis, intended for use by junior members, or beginners to build small 5" gauge shunter type locos, each using a bogie as a base. They come complete with two motors each, but the rest should be fabricated by the participants. Wizard idea! Now then, how's about, making a simple speed controller with power mosfets. Such unsophisticated speed controllers are very easy to make using only a couple of extra components, and are a simple introduction to electronics for the beginner. They often require only a potentiometer, a mosfet, plus a few other cheap bits. I use them in my 5-inch gauge diesel shunter. Total cost, about £5. They also work as a dimmer for filament lamps. The oldest Welling club loco was built in 1946 to a Basset-Lowke design, and the current editor would like to drive it, when it is restored and he learns to drive! These items originated from Malcolm's estate. An interesting project was the St Edward's Hospital



Photo 5: Royal Enfield at Wortley Top forge.

Tramway, Cheddleton, in Staffordshire. It closed in 1954 and could inspire a good model. Some interesting web sites are suggested, as usual. The compiler says he finds terrestrial tv quite bland so turns to the internet and YouTube for more thoughtful fare. I find this too, www.dmes.co.uk Royal Enfield currently holds the title of the world's largest selling big motorcycle (350cc or greater). Manufactured in India, where they have to be capable of handling poor roads and patchy maintenance and keep going, it is the first such machine created wholly in India. The Bullet has been in continuous production since 1948, even longer than the Myford Super 7! This Continental GT was spotted at Wortley Top Forge, North of Sheffield, The company is an Anglo-American organisation, with bases in UK, USA and India, **photo 4**. In contrast a 'push bike'; observe the Penny Farthing in **photo 6**. Just thinking about the consequences of a sudden stop brings tears to my eyes. And finally, on the conversion of Austerity loco 2890 to a tender engine, by Mid Hants railway: "Look at the dome on that! I bet you don't get many of them to the pound". 🍷



Photo 6: Interesting decorations on this vintage Penny Farthing.

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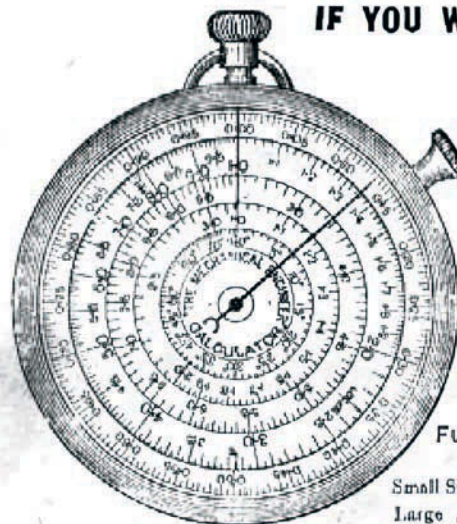
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MAGAZINES, BOOKS AND PLANS

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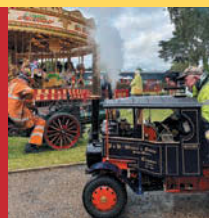
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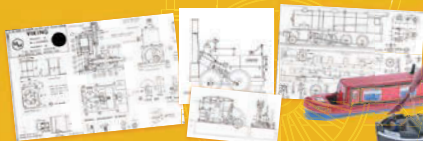
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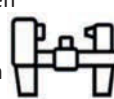
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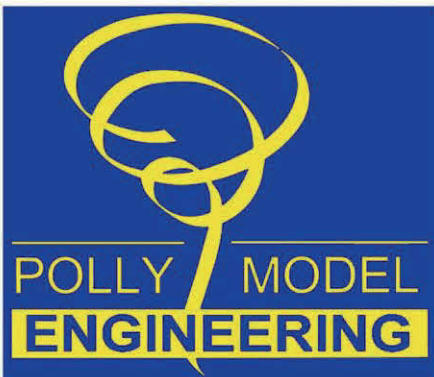
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